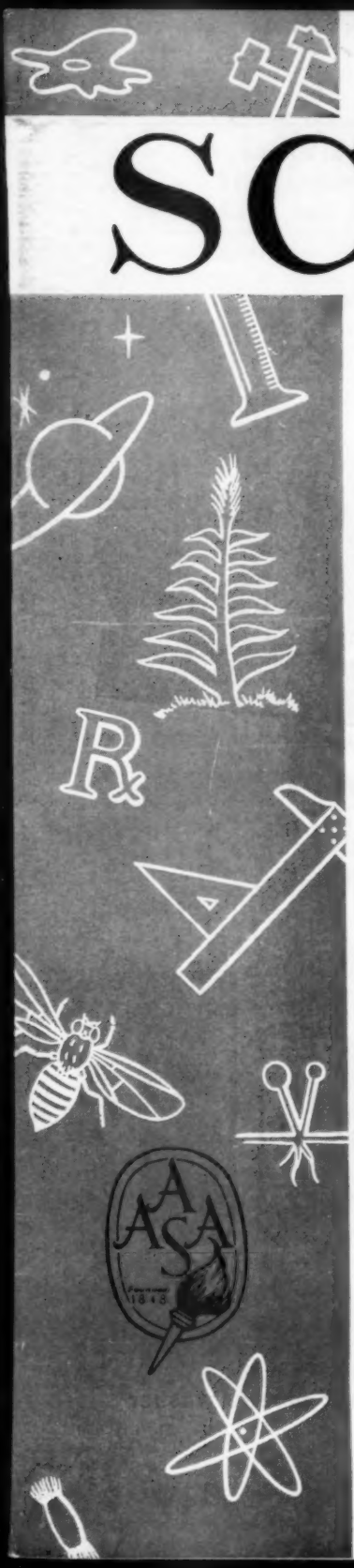

SCIENCE

24 SEPTEMBER 1954

VOLUME 120 NUMBER 3117

U.S. Geological Survey Radiocarbon Dates I: *H. E. Suess* 467

Purity and Adequacy of Foods: *R. R. Williams* 473

News and Notes

Indian Association; and Regular Departments 476

Book Reviews

Airplane Structures; Symbolic Wounds; Fluid Dynamics; Intertidal Invertebrates of the Central California Coast; Adaptation in Micro-organisms; Introduction to the Chemistry of Enzymes; Dynamics of Virus and Rickettsial Infections; Introduction to Nuclear Engineering; First Course in Ordinary Differential Equations; New Books; and Miscellaneous Publications 488

Technical Papers

Metabolic Oxidation of Phenobarbital to *p*-Hydroxyphenobarbital: *T. C. Butler* 494

Determination of Isotopic Carbon in Organic Compounds: *K. E. Wilzbach* and *W. Y. Sykes* 494

Enhancement of Biological Activities of Corticosteroids by Substitution of Halogen Atoms in 9α Position: *G. W. Liddle, M. M. Pechet, F. C. Bartter* 496

Serum Glutamic Oxaloacetic Transaminase Activity in Human Acute Transmural Myocardial Infarction: *J. S. LaDue, F. Wróblewski, A. Karmen* 497

Biuret Toxicity of Urea Foliage Sprays on Citrus: *W. W. Jones* 499

Investigation of the Reported Toxicity to Rats of *Gliricidia sepium*, Jacq.: *L. E. Gale, M. R. Gibson, P. M. Scott* 500

A Device for Determining Time and Temperature of Sterilization in the Autoclave or Hot-Air Oven: *J. H. Brewer* and *C. B. McLaughlin* 501

Apparent Simultaneous Adaptive Enzyme Formation in C_{57} Mice: *P. Feigelson, M. Feigelson, T. R. Wood* 502

Communications

Tests for Photoreactivation in Gametes of *Urechis caupo*: *R. M. Iverson* and *A. C. Giese* 504

Remarks on "Stress and the Toxicity of Schizophrenic Serum": Discussions by *F. Georgi, H. P. Rieder, R. Weber*; *R. Fischer* 504

More on "Different IQ's for the Same Individual": Discussions by *Q. McNemar*; *R. M. Dreger* 506

Serial Cultivation of Normal Human Embryonic Cells Directly on Glass: *E. M. Zitver, R. Cailleau, P. L. Kirk* 507

Electron Microscope Observations of the Formation of Aluminum Phosphate Crystals with Kaolinite as the Source of Aluminum: *J. A. Kittrick* and *M. L. Jackson* 508

Association Affairs

Programs of the Berkeley Meeting, 26–31 December: *R. L. Taylor* 509

Chemicals in Food 7A

Meetings & Conferences 10A

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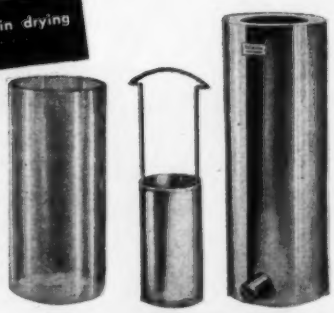

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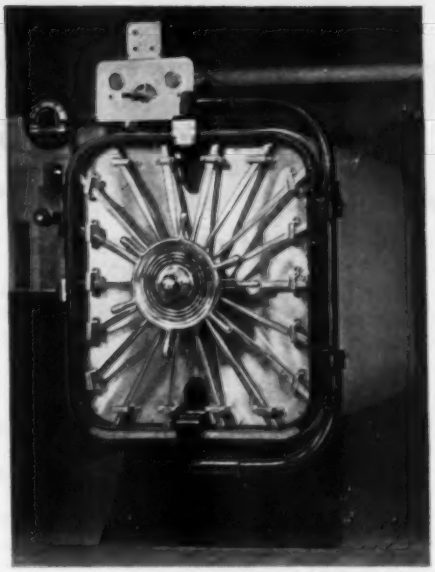

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1. The three-part General Symposium: "Science and Society."
2. Programs of the 18 AAAS sections (symposia and contributed papers).
3. Programs of the more than 70 participating societies.
4. The Special Sessions: AAAS, Academy Conference, Third Berkeley Symposium on Mathematical Statistics and Probability, Conference on Scientific Editorial Problems, National Geographic Society, Pacific Science Board, Phi Beta Kappa, Phi Kappa Phi, RESA, Sigma Xi.
5. Details of the Gymnasium for Men—center of the Meeting—and campus.
6. Titles of the latest foreign and domestic scientific films to be shown in the AAAS Science Theatre.
7. Exhibitors in the 1954 Annual Exposition of Science and Industry and descriptions of their exhibits.

Directory content

1. AAAS officers, staff, committees for 1954.
2. Complete roll of AAAS presidents and their fields.
3. The 260 affiliated organizations.
4. Historical sketch and organization of the Association; the Constitution and Bylaws.
5. Publications of the Association.
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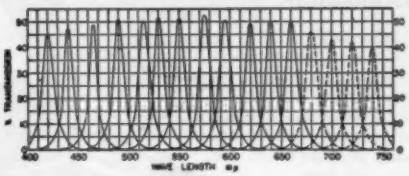

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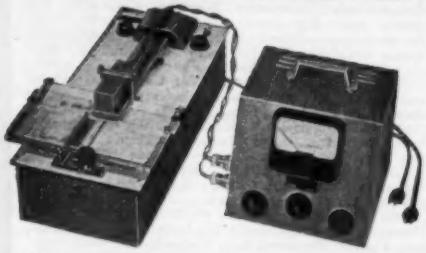

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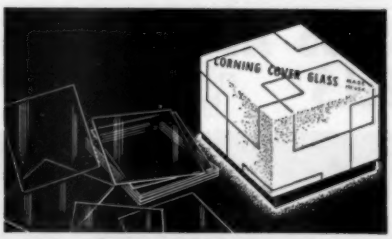

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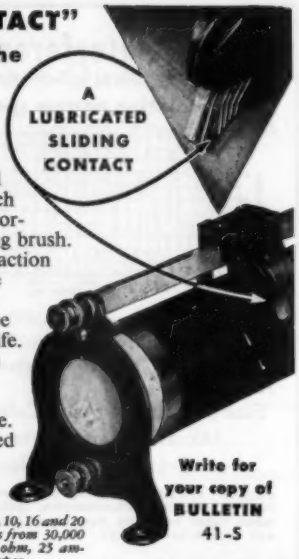

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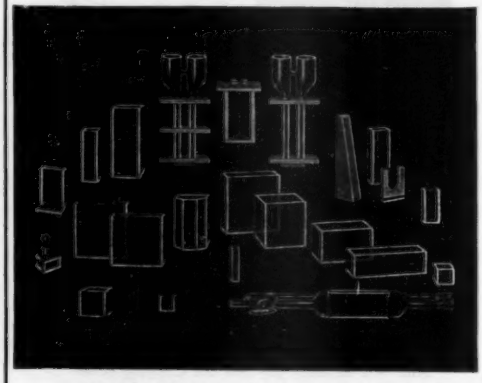

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Chemicals in Food

THE subject of chemicals in foods has become one of considerable interest during the last 4 or 5 years because a large number of important scientific developments have resulted in the application of chemical substances to our natural foods. In evaluating the use of chemicals in foods, it is necessary to maintain a proper perspective. Chemicals are added to foods for many reasons. During growth, insecticides and fungicides are used to reduce pest damage and to increase production. The residue of some insecticides remains on the food and must be removed to within tolerance limits. Finding an insecticide that leaves no residue harmful to human beings, yet still kills insects, is only one of the problems involved.

During processing and packaging, chemicals may be added to our foods to increase nutritive values, to preserve color and flavor, to prevent oxidative changes during the period between packaging and consumption, to improve processing and packaging techniques, and to promote edibility, ease of use, and, in general, consumer acceptance.

For all these reasons, we are at present dependent upon the products of chemical technology in food production, and modern production cannot be maintained without the cooperation of the chemical industry, the food industry, and the government. New developments come forward rapidly—so rapidly that their evaluation strains the facilities for checking these products as they appear. The food industry has initiated a large number of studies to cover the pharmacologic and toxicologic problems involved—purity and adequacy of foods, the nutritive value of chemicals used in food processing, the depletion of spray deposits on crops before harvesting, and many others. One major difficulty in conducting these studies is that we are limited to animal experiments in finding proof of the lack of hazard in the use of a particular chemical. Even after the pharmacologist has completed his tests on animals, he is not always certain that the chemical substance will be entirely safe for man. Many scientists have advocated human experimentation, although of course under carefully controlled conditions.

Another aspect of the subject of chemicals in food is the legal one as set up by the Federal Food, Drug, and Cosmetic Act, administered by the Food and Drug Administration. Under the present act, poisonous and deleterious substances must not be used in foods shipped in interstate commerce. Changes have been proposed in this act and it is hoped that a definition of what is poisonous and deleterious will be forthcoming.

The entire matter of handling pharmaceutic studies, technologic problems, and public health problems is extremely complex, as is shown by the papers presented at the symposium on chemicals in foods at the Boston meeting of the AAAS. The food technologist, the medical man, the nutritionist, legal and scientific control agencies, the pharmacologist, the biochemist, the dietitian, the biologist and the consumer all are involved. These papers consider nutrition, purity, food law, spray deposits, medical testing, food industries, the food supply, and the consumer. One of them, "Purity and adequacy of foods" by R. R. Williams, appears in the present issue of *Science*. Others in the series will be published in *The Scientific Monthly*.

These papers should serve as a guide and source of information to all those interested in our foods, both consumers and producers. Progress in the food industry is dependent upon the wise use of the discoveries of the agriculturist, the food technologist, the chemist, the biologist, and the engineer. We cannot turn backward. We must go forward with the help of increasing knowledge, guided by the best minds and the best information that science has made available.

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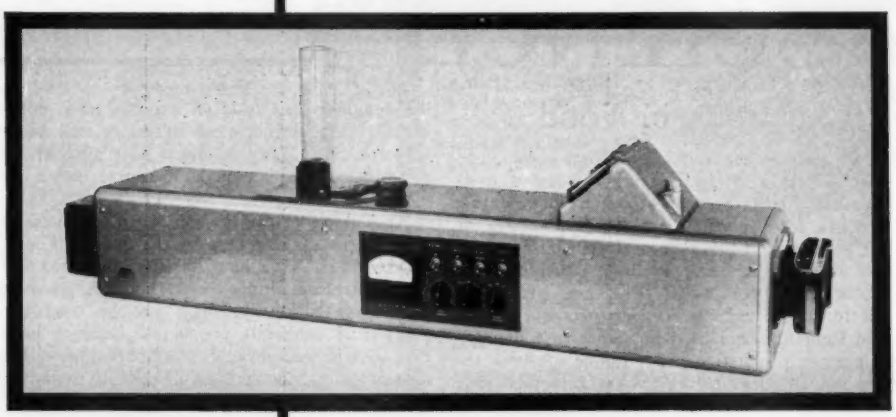

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U. S. Geological Survey Radiocarbon Dates I*

Hans E. Suess

U.S. Geological Survey, Washington, D.C.

A PRECEDING paper (*1*) described the technique and equipment used at the U.S. Geological Survey for radiocarbon measurements by acetylene counting in the proportional region and the results of test measurements on acetylene prepared from modern and "infinitely" old material. The following table lists the radiocarbon dates obtained by this method for samples of unknown age. It covers the period from the time when these measurements were begun in October 1953 to 30 April 1954.

The dates given are based on 5568 ± 30 yr as the half-life of radiocarbon (*2*). To exclude any possibility of effects from artificial-coal combustion on the specific activity of atmospheric CO_2, wood grown in the 19th century was used for determining the counting rate for modern material from which the ages of organic samples were calculated. All dates on sea shells were obtained from comparison with modern shells from the same locality. Four samples of modern shells, W-14, W-39, W-25, and W-73, were investigated for this purpose and gave the same carbon activity as modern wood within an error of ±1 percent, contrary to what was expected from C^{13} measurements (*3*).

The error listed is composed of (i) the standard counting error due to statistical fluctuations in the radioactive decay, (ii) the uncertainty in the background and modern standard measurements, and (iii) isotope separation effects during the preparation of the acetylene samples. The listed errors are equal to or somewhat greater than the standard error σ conventionally assigned to radiocarbon measurements (*2*). The errors do not take into account possible field contamination of the samples with carbonaceous materials of a different age. From experience, however, it is known that such contamination is in general negligible, except perhaps for very old samples of an age of more than 32,000 yr, where the observed activity could have originated from the addition of a fraction of a percent of modern carbon.

The samples are numbered in sequence of their preparation and measurement. Numbers missing in the list were assigned to measurements on "dead" or on contemporaneous materials or to test runs on material of precisely known age. The prefix W, for Washington, distinguishes our numbers from those of other laboratories.

The ages of most of the samples were determined for the purpose of dating pre-Mankato substages of the last glaciation. Most of the samples dated in this connection were selected and made available to us by Richard F. Flint, Yale University (*4*). The dates on these samples show that a major glacial advance took place on the North American continent some 20,000 yr ago. The advance reached its maximum extent between 18,000 and 19,000 yr ago, penetrating, at least in Illinois, farther south than any other previous substage of Wisconsin glaciation. Comments on the other groups of measurements are given in the table.

Wood, peat, and other organic samples were washed with hydrochloric acid in order to remove carbonates before burning. The counting time ranged from 30 to 60 hr for each sample with 48 hr of counting for the average run.

The list contains sample descriptions as obtained from the submitter. Our own comments, if any, are given in short preambles to groups of determinations.

Corrinne Alexander carried out the conversion of the samples to carbonate. Since 1 December 1953, Meyer Rubin assisted me in the technologic procedure of the acetylene preparation and, as a geologist, gave valuable advice on the selection of samples and interpretation of results.

RADIOCARBON DATES

No.	Sample	Age (yr)
I.	*Samples with oceanic implications*	
	A. *Baja California sea shells* Assembled by C. L. Hubbs, University of California, for the purpose of finding evidence of changes of water temperature with time along the California coast. The O^{18} temperature of these shells was determined by H. C. Urey *et al.* at the University of Chicago (unpublished). These O^{18} determinations further show that no CO_2 exchange has taken place between the atmosphere and the shells. The series was measured to provide an example of consistent shell dates. The shell-charcoal pair, W-26 and W-27, shows excellent agreement. The shell ages are computed using W-25 (*1*) as the modern standard.	
W-29	*Tivela stultorum* Mawe: Near top of grade toward San Quintin on north side of Socorro Cañon along "highway." Collectors, A. A. Allanson and James Valentine, University of California. The smaller size of shells suggests a warmer sea temperature than at present. O^{18} temperature, 17.8°C.	330 ± 160

RADIOCARBON DATES—(*Continued*)

No.	Sample	Age (yr)
W-31	*Tivela stultorum* Mawe: On sand dunes at San Antonio del Mar (Johnson Ranch), close to ocean beach. The smaller size of shells suggests a warmer sea temperature than at present. Collectors, A. A. Allanson and James Valentine. 0^{18} temperature, 18.2°C.	300 ± 160
W-32	*Cryptochiton stellifer* Middendorff: Midden near coast on alluvial flat, eroded from about 2 ft below surface; 0.1 to 0.2 mi south and southeast of large ancient sand dune just south of mouth of Rosario Cañon. The abundance of *Cryptochiton* suggests temperatures lower than present. Collectors, Carl L. and Laura C. Hubbs, University of California. 0^{18} temperature, 16.7°C.	650 ± 200
W-26	*Mytilus californianus* Conrad: Rim of cliff on most prominent point between Punta San Isidro and the first main point south of Punta Cabras. Taken from midden at a depth of between 3 and 4 ft in relatively uniform midden 4 to 5 ft deep. Collectors, Carl L. and Laura C. Hubbs and A. A. Allanson, University of California. 0^{18} temperature, 17.1°C.	2540 ± 200
W-27	*Charcoal*: Taken from the same place as W-26 for the purpose of checking its C^{14} age against that of the shells. Fragments in good condition obtained by flotation. Collectors same as for W-26.	2500 ± 200
W-30	*Mytilus californianus* Conrad: On west side of Punta Baja, in midden opposite north end of wide reef; in cliff face about 5 ft below crest; from a definite hearth about 2.5 ft in diameter in old sand-dune material, lying above 1 ft of sand without shells and below 2 ft of sand without shells. Expected to be relatively old. Collectors, Carl L. Hubbs and Laura C. Hubbs. 0^{18} temperature, 17.1°C.	4030 ± 200
	B. *Sea-level changes and strand lines* A plan to investigate late Pleistocene sea-level changes was begun by the determination of the following six samples from America, northwestern Greenland, and Australia. Samples W-74 and W-75 are of methodologic interest, because determinations on them show that in more than 32,000 yr no exchange with younger carbonate has occurred to an extent that could influence the accuracy of radiocarbon dates.	
W-40	*Shells, Sagadahoc Bay, Maine*: Mya shells from a more or less continuous, extensive layer approximately 3 ft below the present flat on the coast of Maine. According to W. H. Bradley, U.S. Geological Survey, who collected and submitted this sample, this layer was caused by a catastrophic event such as the combination of an earthquake and big storm at high tide.	1050 ± 160
W-48	*Whale baleen*: From the Thule area, northwestern Greenland. The whale was buried under 8.5 ft of permafrost in beach deposits at an elevation of 43.6 ft, 76 ft below the highest beach in this area. Collector, D. B. Krinsley, U.S. Geological Survey.	8500 ± 200
W-72 W-74 W-75	*Shells, Saunders Island*: *Mya truncata* (*artica*) from raised marine deposits on the north coast of Saunders Island, northwestern Greenland. Collector, D. B. Krinsley.	
	W-72: collected 80 ft above present strand line.	8570 ± 200
	W-74: collected 50 ft above present strand line.	Older than 32,000
	W-75: collected 15 ft above present strand line.	Older than 32,000
W-95	*Wood, Yarra River* (*Eucalyptus rostrata*) excavated during the building of the Spencer Street Bridge in Melbourne, Australia. Part of a large stump that was in position of growth 63 ft below the present low-water mark. The sea must have been at least 10 ft lower than this level at the time that the tree grew. Submitted by E. D. Gill, National Museum of Victoria, Australia.	8780 ± 200
II.	*Glacial samples*	
	A. Eastern United States	
W-44 W-45 W-46	*Durham Meadows Lake deposits*, from the valley of the Coginchaug River approximately 8 mi southeast of Middletown, Conn. The samples come from a section with three organic zones lying on a bed of gravel and sand, overlain by 1 m of sandy clay and clay. The stratigraphy of this section is now being studied by pollen analy-	

No.	Sample	Age (yr)
	sis at Yale University. Collected by Estella B. Leopold and submitted by G. E. Hutchinson, Yale University.	
	W-44: log from upper peat horizon at 1 m depth.	4800 ± 400
	W-45: upper peat, sampled at about 1 m depth.	7570 ± 250
	W-46: gyttja from depth of 2.8 to 3.0 m, the lowest of the three organic layers resting on sand and gravel.	12,700 ± 280
W-66	*Bridgeville, Pennsylvania*: Peat from beneath 5 m of alluvium just west of Bridgeville, Pa. The section is described by J. M. Schopf and A. T. Cross in *Am. J. Sci.* **245**, 426 (1947). Believed by these authors to represent an interglacial deposit, most plausibly from the Tazewell-Cary interval. Dated by Libby (C-438) as older than 16,000 yr. Submitted by E. R. Eller, Carnegie Museum, Pittsburgh.	23,000 ± 800
W-87	*Otto, New York*: Peat from the east bank of South Branch Cattaraugus Creek, Cattaraugus quadrangle, N.Y., about 0.2 mi south of the village of Otto, at the base of a 70- to 80-ft stream bank on the outside of a bend and close to normal stream level. The section is described by P. MacClintock and E. Apfel in *Bull. Geol. Soc. Amer.* **55**, 1143–1164 (1944). Collector, C. S. Denny, U.S. Geological Survey.	Older than 35,000
	B. Ohio	
W-33	*Cleveland*: Wood from a stratigraphic horizon between deposits of Lake Arkona and Lake Whittlesey. Predicted date, "Late Cary." Collector, G. W. White, University of Illinois.	13,600 ± 500
W-37	*Camden moraine*: Wood from a locality, 6 mi south of Dayton, overlain by 16 ft of Cary till. Identical with C-508, dated by Libby as older than 17,000 yr. Collected by R. P. Goldthwait, Ohio State University.	20,700 ± 600
W-71	*Cleveland varved silt and clay horizon*: Wood from the pit of the Cleveland Sand and Gravel Co. The varved horizon from which the wood came immediately overlies 1.5 ft of yellow loess, which in turn overlies a dark brown loess correlated with the Farmdale by G. W. White and A. B. Leonard. The varved lake beds are under 7 ft of till. Section described in *Am. J. Sci.* **251**, 363 (1953). Collector, G. W. White.	24,600 ± 800
W-88	*Newark*: Wood from a horizon of twigs and logs between 40 and 60 ft deep in excavations for deep building foundations for the Kaiser Aluminum and Chemical Corp., 0.3 mi west of state highway 79, 0.2 mi east of the Bucyrus line of the New York Central Railroad, and 0.1 mi south of Ramp Creek. Predicted age: Tazewell. Collector, R. P. Goldthwait.	21,400 ± 600
W-92	*Oxford*: Butler County, Oxford Township, NE¼SW¼sec. 26, at north edge of the Hamilton quadrangle, (USGS map, reprinted 1942). One of dozens of similar logs that protrude end-on from till at depths of 30 to 60 ft below the original till surface on a branch of Talawanda Creek. This one protruded from 5 ft above the till base and 50 ft below the till surface. Here till overlies laminated greenish-gray lake beds 2 to 5 ft thick resting on bedrock, but 200 yd downstream the lake beds overlie a second lower till. In places a thin seam of leaf litter with a 6-in. leached zone has been observed buried on the lower till. Similar to C-465 dated by Libby as "at least 15,000 yr old." Collector's interpretation: upper till, Cary; lower till, Tazewell. Collector, R. P. Goldthwait.	19,980 ± 500
W-96	*Twin Creeks*: Log from peat bed under 90 ft of till on Twin Creek in Montgomery County, German Township, sec. 18 SE near Germantown. Section described by F. Leverett in *U.S. Geol. Survey Mon.* **41**, 363–366 (1902). Organic layer rests on deep gravel fill. Submitted by R. P. Goldthwait.	Older than 34,000
W-91	*Chillicothe*: Log projecting from till bank along Biers Run in Ross County, South Union Township, 5½ mi northwest of Chillicothe. Overlain by 2 ft of fine sand and 3 ft of till. Prior to an earlier stream cutting, sample was covered by at least 20 ft of additional till. Predicted age: Tazewell. Collector, R. P. Goldthwait.	18,050 ± 400
	C. Indiana	
W-57	*Steuben County*: Fibrous, woody peat with twigs, conifer	12,380 ± 370

No.	Sample	Age (yr)
	needles, and wood fragments from a location in the NE¼-NE¼sec. 2, T37N, R14E. From surface downward the section includes 3.5 ft clay, 2 to 3 ft gravel and sand, 4 in. peat layer (sample horizon), 9 in. marl resting on calcareous till. Correlated with "Late Cary" by the collector, W. J. Wayne, Indiana Geological Survey.	
W-65	*Steuben County*: Another sample from same location as W-57 was collected by Wayne in order to exclude the possibility of the presence of any modern rootlets.	13,020 ± 400
W-58	*Noble County*: Wood from a section in the SW¼SE¼sec. 12, T33N, R11E, resting on contact of calcareous gravel (Tazewell?) and beneath 2 ft of a black, fossiliferous (Mollusca), peaty clay. The organic bed underlies 3 ft of calcareous gravel and sand; 3 ft of alluvial sand and silt caps the exposed section. The organic bed is now believed to represent a deposit in a lake dammed by ice or a valley train when the ice stood at the Wabash moraine in late Cary time. Collector, W. J. Wayne.	12,380 ± 360
W-59	*Porter County*: Fragments of a log, collected in the SW¼NW-¼sec. 5, T32N, R5E, buried in calcareous gravelly sand about 5 ft below the surface of an outwash along the Kankakee River valley in an abandoned pit. Was believed to be of middle to late Cary age. According to collector W. J. Wayne, the date indicates a postglacial reworking of the gravel and sand, made possible by the combined volume of the Kankakee and St. Joseph rivers, the latter now flowing northward to Lake Michigan.	7990 ± 200
W-61	*Noble County*: Gyttja, SE¼-SW¼sec. 27, T35N, R11E. A noncalcareous, black, laminated lake deposit collected from beneath 10 ft of marl. It represents the first organic deposit after the melting of an ice block. Collector, W. J. Wayne.	6720 ± 200
W-64	*Wabash County*: SE¼NE¼sec. 9, T29N, R6E. Gyttja, black to dark gray, generally noncalcareous but containing some proken mollusk shells. Collected from beneath 12 ft of marl.	13,140 ± 400

RADIOCARBON DATES—(*Continued*)

No.	Sample	Age (yr)
	From the bottom deposit of a kettle lake formed by an ice block from the Packerton moraine. Predicted correlation: Early post-Cary maximum. Collector, W. J. Wayne.	
	D. Illinois	
W-67	*Lake Bloomington Spillway*, McLean County: Wood fragments from a discontinuous peat layer separating an oxidized upper gray till from a middle gray till. Above the upper gray till is 12 ft of Normal till underlain by 6 ft of Bloomington till. Collected by Leland Horberg and J Harlen Bretz, University of Chicago.	Older than 34,000
W-68 W-69	*Farm Creek*: Two wood samples from the "Farmdale" loess, previously dated by Libby (C-509 and C-510) as older than 19,000 and 20,000 yr. Collector, Guy D. Smith, U.S. Department of Agriculture. W-68: from 0 to 1 ft below surface of loess. W-69: from 3 to 4 ft below surface of loess.	 22,900 ± 900 25,100 ± 800
W-79	*Wedron*: Wood from Lake Kickapoo deposits at Wedron. From dark peaty silt occurring in a bedrock valley in St. Peter sandstone. The wood horizon is overlain by periglacially deformed sand and dark silt, which in turn underlie laminated clay (Lake Kickapoo deposits). Lake Kickapoo is now regarded as being "Farmdale" in age by the Illinois State Geological Survey. Tazewell tills overlie the lake beds. Similar to C-575 determined by Libby to be "older than 17,000." Section described by H. B. Willman and J. N. Payne, in *Illinois State Geol. Survey Bull.* No. 66, p. 307, sec. 68. Collector, J Harlen Bretz.	24,000 ± 700
	E. Minnesota	
W-99	*Redwood Falls*: Spruce wood from depth of 9 ft in till on stream bank, sec. 3, T112N, R35W, Paxton Township, Redwood County, 3½ mi east of Redwood Falls. The till is presumed to be Mankato age, in the heart of the Des Moines lobe. The wood is probably transported and conceivably came from an older drift. Submitted by H. E. Wright, Jr., University of Minnesota.	Older than 31,000

No.	Sample	Age (yr)
W-101	*Ironton*: Spruce wood from silt at a depth of 108 ft in the Manuel mine on the Cuyuna iron range, near Ironton. In the immediate area, there are two drifts of Mankato age and one or two drifts of Cary age. Collector, H. E. Wright, Jr.	Older than 32,000
W-102	*Bronson*: Wood taken from a well at a depth of 88 ft at Bronson, Kittson County, in the region of Mankato drift. Section described by C. O. Rosendahl in *Ecology* **29**, 291–296 (1948) consists of (from surface down) 20 ft of Lake Agassiz sediments, 46 ft of till, 22 ft of gravel, sand, and clay, 3 ft of peat (sample horizon), and 16 ft of clay (lacustrine). Boring stopped at 107 ft. Similar to C-496 determined by Libby to be "older than 19,000." Collected by C. O. Rosendahl, submitted by W. S. Cooper, both of University of Minnesota.	Older than 36,000
	F. Canada	
W-100	*Port Talbot, Ontario*: Gyttja from the base of a modern cliff of Lake Erie. Gyttja is overlain by 100 ft of till, which consists of two divisible beds. Collector, A. Dreimanis, University of Western Ontario, London.	Older than 32,000
	G. Alaska	
W-43	*Healy Creek*: Healy D-4 quadrangle, SE¼NW¼sec. 20, T-12S, R6W, Fairbanks meridan. Driftwood log from 40 to 50 ft below top of 80 to 100 ft terrace on Healy Creek, which is correlated with the Carlo deposits of the Nenana River. According to the collector, the wood does not necessarily date the Carlo glacial advance. Collector, C. Wahrhaftig, U.S. Geological Survey.	3500 ± 200
W-49	*McKinley Park*: Peat from pond formed by damming by terminal moraine of Riley Creek glaciation and stagnant ice; should date from just slightly after Riley Creek glacier maximum advance. Collector, C. Wahrhaftig.	10,560 ± 200
W-53	*Slana-Tok Highway*: ⅓ mi east of Ahtell Creek bridge. Wood from peat at base of interbedded blue till, peat, and outwash of drift of "Wrangell glaciation." Wrangell drift rests unconformably on hill slope cut into brown gravels of "Ahtell glaciation." Predicted correlation: Late Wisconsin. Collector, H. E. Wright, Jr. Comment by collector: Date is too young for geologic correlation . . . conceivably that peat was part of postglacial slump sequence. . . .	3300 ± 200
W-62	*Denali Highway area*: 1.4 mi north of mouth of Raft Creek. Trunk and root stumps of presumed black spruce. Wood rests in outwash of Hatchet Lake glacial age at inner edge of the Hatchet Lake moraine, in deformed layer. Comment by collector: Improbable that this dates the Hatchet Lake glacier moraine. Possibility exists that the stream undercut its bank, depositing the wood and causing deformation. Collectors, D. M. Hopkins and D. R. Nichols, U.S. Geological Survey.	1100 ± 200
W-78	*Bartlett Valley*: Wood from the lower of two till units separated by a buried forest zone ½ mi from present front of Bartlett glacier at the head of Placer River valley in the North Kenai Mountains area. Upper till unit has incipient soil development. Collector, T. N. V. Karlstrom, U.S. Geological Survey.	2370 ± 200
W-76	*Tustumena*: Partly lignitized wood from outwash sands in bluffs on northwest shore of Tustumena Lake, Kenai Peninsula. This sample should have been identical with L-117J dated 15,800 ± 400 yr by J. L. Kulp. Collector, T. N. V. Karlstrom.	Older than 32,000
W-77	*Goose Bay*: Wood from buried peat overlying glacial outwash deposits and underlying till, near Goose Bay, north shore, Knik Arm. Should have been identical with L-117A dated 19,100 ± 900 yr, by J. L. Kulp. Collector, T. N. V. Karlstrom.	Older than 32,000
	H. Comparison with European samples	
W-42 W-83	*Two Creeks Forest, Manitowoc County, Wis.*: Two determinations on wood from the type locality of the "Two Creeks Forest Bed" were carried out for direct comparison with samples from the Allerod-Younger Dryas boundary in Denmark. Five previous determinations	

RADIOCARBON DATES—(*Continued*)

No.	Sample	Age (yr)
	on wood from this locality by Libby (C-308, 365, 366, 536, and 537) gave an average of 11,404 ± 350 yr. Collector, F. T. Thwaites, University of Wisconsin.	
	W-42: weathered appearance, identical with Y-141.	11,350 ± 120
	W-83: well-preserved appearance, identical with Y-227.	11,410 ± 180
	Average: 11,370 ± 100	
W-81 W-82 W-84	*Ruds Vedby, Denmark*: Two samples from the pollen-zone boundary IIe/III denoting the beginning of the colder climate of the Younger Dryas and the end of the relatively warm Allerod fluctuation. Collected by Johs. Iversen, Geological Survey of Denmark, and previously dated in Copenhagen [*Science* **118**, 6–11 (1953)].	
	W-81: peaty lake mud. Copenhagen date K-102. 10,500 ± 400 yr.	11,170 ± 180
	W-82: wood identical with K-101 dated 10,890 ± 240 yr in Copenhagen.	10,260 ± 200
	W-84: identical with W-82	10,510 ± 180
	Average W-82–84: 10,400 ± 160	
III.	*Other geologic samples*	
W-47	*Twin Lakes, Colo.*: NE¼SW¼ sec. 23, T11S, R80W. Peat from between two tills believed to be of Cary age. Same exposure as W-35. Collector, G. M. Richmond, U.S. Geological Survey, Denver. Comment by collector: Radiocarbon age and further field evidence indicate earth movement.	980 ± 150
W-35	*Twin Lakes, Colo.*: NE¼SW¼ sec. 23, T11S, R80W. Same exposure as W-47. Wood from Cary till. Collector, G. M. Richmond.	Less than 200
W-7	*McDowell County, N. C.*: Buried log from base of peaty sandy clay at 7-ft depth, on North Muddy Creek, 5.2 mi east of Marion. The section shows 5 ft of reddish-brown and brown sandy silt overlying 2 ft of peaty blue-gray sandy clay that rests on basal gravel. The section represents two units of the Recent deposits on the Piedmont; the "modern" (0 to 5 ft) deposited since agriculture was introduced into the area, and the "premodern" (below 5 ft) deposited during post-Wisconsin time. Submitted by W. S. Overstreet, U.S. Geological Survey.	2270 ± 200

RADIOCARBON DATES—(*Continued*)

No.	Sample	Age (yr)
W-28	*Cleveland County, N. C.*: Log buried in peat and muck beneath 15 ft of colluvial sediment, from a gully on the W. Lattimore farm, 2 mi north of Lawndale. The colluvial sediments are an intermediate host for monazite between the crystalline source rocks below and the Recent stream deposits. Submitted by W. C. Overstreet.	Older than 30,000
W-36	*Lakeland, Fla.*: Wood from above a phosphatic pebbly and clayey sand, Pauway mine. Submitted by Z. S. Altschuler, U.S. Geological Survey.	2700 ± 200
W-50	*Mexico, D.F.*: Bellas Artes core. Carbonate from depth of 5.7 to 5.9 m. Believed to represent a moist period. Collector, P. B. Sears, Yale University.	4900 ± 250
IV.	*Archeology*	
W-85 W-86 W-89 W-97 W-98 W-104	*Haua Fteah Cave, Cyrenaica, North Africa*: Samples of cave earth with traces of charcoal, collected by C. B. M. McBurney Cambridge University, England, and submitted by H. L. Movius, Jr., Harvard University. According to McBurney, the cave deposits constitute one of the longest and most complete archeologic sequences so far known in North Africa (C. B. M. McBurney, J. C. Trevor, and L. H. Wells, *Nature* **172**, 889 (1953). A Neandertaloid jaw was excavated at a depth of 23 ft. The uppermost layers contain Roman pottery. According to R. W. Hey (Cambridge, England), the lower sections in the cave, ranging from about 16 to 28 ft in depth, were deposited under damp temperate conditions without appreciable winter frosts. The nature of the deposits from 10 to 16 ft below the present surface indicate a sharp and prolonged increase in the incidence of winter frosts. The layers above this indicate a gradual transition to the climate of the present day. The change to the colder climate at the 16-ft level coincides approximately with the end of the Mousterian culture and the beginning of the Upper Paleolithic in that area. W-85 is the first absolute date ever obtained for Livalloiso-Mousterian material. Although not quite conclusive by itself, it constitutes together with W-86 a strong indication for	

RADIOCARBON DATES—(*Continued*)

No.	Sample	Age (yr)
	a survival of *Homo neandertalensis* in that region until about 30,000 yr ago. The large difference between the dates W-97 and W-86 indicate erosion or a change in the rate of deposition.	
	W-98: 6.5- to 7.3-ft depth (collector's reference letter: B_1). Undisturbed traces of a primitive "Neolithic"—presumably food-producing—culture; the first of this kind in the area.	6800 ± 350
	W-89: 7.3- to 8.0-ft depth (C). Evolved blade industry; microlithic and other culture elements new to area. No traces of pottery or other definite indications of Neolithic, yet this culture may be ancestral to true Neolithic and shows less resemblance to the industries immediately underlying.	7300 ± 300
	W-104: 9.4- to 10.0-ft depth (F). Evolved blade and burin industry, essentially upper Paleolithic in character.	10,600 ± 400
	W-97: 11.2- to 12.0-ft depth (I). Industry approximately as for W-104.	12,300 ± 350
	W-86: 15.5- to 16.0-ft depth (N_3). This sample came from small hearth containing insufficient archeologic material for a cultural diagnosis. The hearth occurs immediately below a suspected disconformity, immediately above which occur the earliest remains indicating a blade and burin industry in this section. Since a percentage of the specimens show exceptional degree of chemical weathering, it is likely that they were deposited at a period when little or no sedimentation was taking place at this locality in the cave.	28,500 ± 800
	W-85: 19.0- to 19.7-ft depth (O_3). Hearth deposit associated with true Mousteroid (Levalloiso-Mousterian) industry.	34,000 ± 2,800 (or possibly Older)
W-93	*Poggenwisch, Holstein, Germany*: Calcareous lake deposit (gyttja) from a glacial kettle 15 km northeast of Hamburg, between Meiendorf and Ahrensburg. The deposit should date an Upper Paleolithic culture of reindeer hunters, somewhat younger than that of the Meiendorf type locality, and should be of "Older Dryas" age. Expected age 15,000 yr or possibly older. Collected by A. Rust, Ahrensburg, and obtained through H. L. Movius, Jr., Harvard University.	15,150 ± 350

References and Notes

* Publication authorized by the director, U.S. Geological Survey.

1. H. E. Suess, *Science* **120**, 5 (1954).
2. W. F. Libby, *Radiocarbon dating* (Univ. of Chicago Press, Chicago, 1952).
3. H. Craig, *J. Geol.* **62**, 115 (1954).
4. In particular, we are indebted to Dr. Flint for samples 33, 35, 37, 44, 45, 46, 47, 50, 57, 58, 59, 61, 64, 65, 66, 67, 68, 69, 71, 79, 83, 88, 91, 92, 93, 96, 100.

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Robert R. Williams

Research Corporation, New York 17

THE Federal Food and Drug Administration is the agency responsible for enforcing the Food, Drug and Cosmetic Act of 1938, as it was for the preceding law enacted in 1906. It is of prime significance from the standpoint of public relations that each of these laws in turn have often been referred to in common parlance as the "Pure Food Law."

It has been my good fortune to have enjoyed a personal acquaintance with every person who has so far held the position of Commissioner of Food and Drugs. They have been men of varied temperaments, interests, and professional trainings, yet we are fortunate that all of them have been persons of highest integrity with a genuine zeal for protecting the public against both deliberate frauds and confusion of counsel. The needs of the country have, of course, changed with the progress of industry and of public understanding of the need for safeguarding the food supply.

At the time of Harvey Wiley's initiation, a considerable practice of food adulteration and sophistication had grown up, and the zeal of a reformer was required to attack it—sometimes fanatical zeal. However, American food industry as a whole was quick

to recognize that a sanely administered pure food law would not only protect the public but also safeguard the best elements of industry against unscrupulous competion by the worst elements. Relations between food industry and food officials have grown steadily more cordial and for years have presented an unusual degree of harmony between the policeman and the policed. This has been invaluable in making food law effective and would have been impossible if the breath of scandal and corruption had ever entered the Food and Drug Administration service.

One must hasten to deny, however, that there are no disputes or dissensions. The food industry presents very large and diversified interests, and the multiplicity of opportunities for conflict is great. Hence, sharp litigation often occurs in the courts, and charges of bureaucracy are not infrequently made. Thousands of other questions are, however, successfully settled out of court in reasoned adjustments.

The Food and Nutrition Board of the National Research Council had a very different genesis. It came into being in 1940 in the midst of a period of very active research in the field of nutrition. This research had made it clear that the nutritional needs of man, contrary to earlier accepted opinion, are actually very complex. Pronounced nutritional diseases, such as beriberi, pellagra, rickets, scurvy, and xeropthalmia, occurring by accident throughout the world, through misfortunate food habits or restrictions, were clearly due to substances lacking in certain dietaries. For the first time, we knew what the deficiencies were, and it was abundantly clear that it is easy to go wrong in choosing one's food even though no question of toxic impurities is involved. The chief emphasis of the Food and Nutrition Board has, accordingly, been on adequacy of food from the nutritional standpoint.

In spite of this contrast of approach, fruitful cooperation has developed between the Food Administration and the Board. This cooperation began at the time of the Board's birth when the Administration announced hearings on vitaminized white flour, out of which grew what we now know as enriched flour. While a reading of the Food, Drug and Cosmetic Act of 1938 makes it clear that protection of public health is a primary purpose of the law, most of its specific provisions are aimed against economic debasements, deliberate or accidental contaminations, or fraudulent misrepresentations of foods. There are many passages of the law that appear to attach greater importance to protection of the pocketbook rather than of physiological well-being. Other passages appear to imply that if the consumer knows what he is getting he is adequately protected. Protection against his own ignorance of his needs is not specifically provided.

A narrow view of its responsibilities might easily have led the Administration to disavow responsibility for helping to make the prevailing diet more adequate. The position might well have been taken that the Administration's sole job is to insure that the food supply is pure and not misrepresented with regard to identity or quality. To that fact that a broader view was taken is due the developing use of the law to insure that food is adequate as well.

In its earlier years the Board was content to follow the legal advice of the Administration on how its good purposes might be made effective. With increasing experience in food policy questions, the Board has come to appreciate ever more fully that pious pronouncements of aims are often quite ineffective and that a resourceful Board must not rely solely on public education but must also make use of the power of the law where it is applicable.

The Board has aimed throughout its history to avoid the role of ardent and overzealous reformer. Despite an occasional minor slip in judgment, the Board has, as a whole, kept in mind that its pronouncements are likely to be misused for ulterior purposes by parties that have special interests to serve. It has been careful to work with the Food and Drug Administration and with the Council on Foods of the American Medical Association wherever the aims and duties of these organizations may approach or overlap those of the Board.

An early declaration of the Board of 1 October 1941 setting forth its policy with respect to what foods should be fortified with what nutrients and in what amounts was useful to the Food and Drug Administration as a basis of its Statement of Policy on these matters in July 1943. In brief, the position of the Board was to encourage the fortification of refined cereals and corn meal with thiamine, riboflavin, niacin, and iron; of milk with vitamin D, of oleomargarine with vitamin A, of table salt with iodine, all in specified moderate amounts; and to withhold approval of other fortifications until need for them was demonstrated. It is felt that a substantial contribution was thus made to avoid a runaway practice of "pepping up" of foods in general by addition of synthetics.

It has been evident for years that Standards of Identity for Foods fixed by the Administration under the law may often affect the performance of purposes that the Board holds wise from the standpoint of food policy. From the standpoint of the Administration, standards are issued after due process when, in the judgment of the Administration, "honesty and fair dealing in the interest of the consumer" will be promoted thereby. Standards often facilitate the enforcement of the law, since it usually is simpler to ascertain and to prove in court that there is a deviation from standard than to prove that the feature in question is deleterious to health or deceptive in nature.

For purposes of exactitude, definitions and standards of identity for a food have grown very lengthy and detailed, especially in the case of composite foods containing several ingredients, such as bread and ice cream. Much criticism has been leveled at such detailed standards because they may exclude or limit the amounts of certain wholesome ingredients, matters which, in the opinion of some, should be left to the discretion and culinary skill of the manufacturer. The Commissioner of Foods and Drugs should not aspire

to be the chef of all the nation's kitchens, it is said.

The committee of which I am chairman was appointed to inquire into the extent to which the formulation of standards tends to inhibit research and development of new food products of merit. To the regret of everyone concerned, past hearings for the consideration of proposed food standards have sometimes been prolonged for many months at great expense both to the government and to affected industry. Accordingly, our committee has also had the duty to suggest means whereby standards can be set less expensively and more quickly and how their flexibility may be increased by facilitating their ready amendment in response to new developments.

Complete solutions are by no means at hand. The committee is convinced that standards are necessary for proper law enforcement, at least with respect to considerable number of foods. It believes that research and development in standardized foods is considerably handicapped by these standards and that procedures for making and demanding standards need to be shortened to achieve greater flexibility. Four principal recommendations have so far been made:

1) Food standards should be promulgated or amended without hearings, when in response to published proposals, no objection arises from interested parties. When objections are raised, the hearings should be limited to those matters to which objections have been made. Legislation to this effect is now under consideration in Congress with the approval in principle of the Administration, the Food Law Institute, and the Board. No serious opposition is foreseen (*1*).

2) Questions of safety of new chemical additives proposed for use in foods should be removed from the scope of hearings for standard-making purposes, and these questions should be settled by scientific inquiry rather than by quasi court procedures. Specific and satisfactory means for settling these questions of safety, apart from standard hearings, have not yet developed fully. Past experience has shown that these questions have in the past been among the most time-consuming aspects of food standards hearings and their elimination should expedite hearings greatly.

3) The scope of test marketing permits should be extended by Administrative regulation to include (i) new foods that deviate from standard other than through the introduction of a new ingredient, (ii) new foods that may be held "to purport to be" a standardized article through resemblance to same, even when identification with standard may be doubtful, (iii) extension of term of such permits until a new standard comprising the permitted article is promulgated. This recommendation appears to be acceptable in principle to the Administration, but no precise wording has as yet been endorsed (*2*).

4) Practical means should be set up whereby full representation of interested industry may be assured at prehearing discussions with the Administration concerning food-standard proposals that may be projected. By such discussions, it is hoped that hearings will be shortened greatly through focusing attention largely on matters remaining in dispute. The Administration feels some delicacy about selecting its advisors from industry lest they be regarded as "hand picked." Many food industries lack duly constituted bodies to represent them. Means to overcome these difficulties are under study.

As an experiment in this field an informal conference was organized under the auspices of the Food and Nutrition Board for discussion, between representatives of the Food and Drug Administration and of industries concerned, of the use of artificial sweeteners in canned fruits. Berton S. Clark, member of the Food and Nutrition Board and president of the Institute of Food Technologists, is chairman of the conference, which held a most successful meeting on 25 May that appears to promise a large measure of agreement.

The Board greatly values these opportunities to be of service both to the Administration and to food industry in reducing the burdens of law enforcement while fully maintaining the integrity of the law and its administration. Such collaboration at once renders more effective the guidance of food policy that the Board feels equipped to supply and at the same time gives practical experience to the Board in the exercise of its advisory function.

I forebear to discuss several other aspects of food law administration with which the Board is concerned. Notable in this field is the work of the Food Protection Committee, which seeks to furnish useful guidance in the control both of intentional additives to foods and the accidental contamination of foods with residues of pesticides and the like, so necessary to the success of modern agriculture. I do not feel qualified to discuss these aspects competently.

Notes

* Based on a paper presented in the symposium "Chemicals in foods," AAAS meeting, Boston, Mass., 29 Dec. 1953. The author is chairman of the Committee on Definitions and Standards of Identity for Foods, Food and Nutrition Board, National Research Council.

1. This legislation, known as the Hale Amendment, passed and was signed by the President on 15 Apr. 1954.
2. Regulation to this effect has since been published: *Federal Register* (28 Apr. 1954), p. 2469.

News and Notes

Indian Association

The annual general meeting of the Indian Association for the Cultivation of Science was held on 30 July. P. Ray, acting director, in presenting the annual report for 1953–54, said that the association's six research departments, the library, the workshop, and the administrative office continued to function actively during its third year in the new research laboratory building at Jadavpur. He described a 5-yr development plan covering fiscal years 1954–59, a plan that envisages the expansion of facilities with respect to equipment and staff in order to consolidate the present research activities and also to improve the level of efficiency; however, it does not involve the establishment of any new departments. The present recurring charges of the association will continue to be borne by the Government of India, but it is expected that the additional financial assistance that will be required to support the expansion plan will be borne jointly by the Government of India and the Government of West Bengal in the proportion of two to one.

During the year two members of the staff were awarded Ph.D. degrees by Calcutta University, and two others received postdoctoral fellowships for study and research in the United States. In addition, the director reported that four research projects were being conducted for the Government's Council of Scientific and Industrial Research, and also that the Ministry of Natural Resources and Scientific Research had established a number of senior and junior scholarships, under the Scientific Man-Power Committee scheme, to provide research training for deserving students at the association.

The association has started a publication section that has already issued a number of books and monographs, including a book on the history of science in Bengali (*Bijnaner Itihas*) by S. N. Sen and another on nuclear induction by A. K. Saha and T. P. Das. For the former work, the association received a substantial grant from the Government of West Bengal. The publication of a monograph, *Non-aqueous Titration* by S. R. Palit, M. N. Das, and G. R. Somayajulu, was also reported.

A number of lectures and a symposium were organized during 1953–54. G. I. Finch, who was awarded the association's Jay Kissen Mookerjee gold medal for 1950, delivered three lectures on "Electron optics and study of surfaces," "Crystal growth in electrodeposition and in surface reactions," and "Polish, mechanical wear, and lubrication." J. N. Ray gave a series of lectures as Coochbehar professor for 1949 on "Carbohydrate metabolism and the role of some plant nucleotides in the phosphorylation of glucose," "Curariform drugs and their action," and "Anesthetics." The Ripon professorship lecture for 1950 was delivered by T. R. Seshadri on "A line of investigation in the field of plant drugs and insecticides." D. K. Banerjee, M. S. Krishnan, and D. S. Kothari, the association's Ripon professors for 1948, 1949, and 1950, delivered, respectively, a series of lectures on the "Himalayan earthquakes," "Ancient Indian iron ore and the modern iron industry in India," and "Recent advances in statistical thermodynamics." Dilip Kumar Banerjee was awarded the John Wood Burn medal for 1950 and gave an address on "Steroid synthesis." J. C. Ghosh, the president of the association, delivered the memorial lecture, entitled the "Petroleum industry with special reference to India," on the occasion of the 50th anniversary of the death of Mahendra Lal Sircar, founder of the association.

A symposium on high polymers was organized by the department of physical chemistry; it was followed by a very successful 3-day summer course on the subject. Prof. Ray ended his report with a brief review of the researches carried out by the association during 1953–54. It was announced that C. C. Biswas succeeded J. C. Ghosh as president, that S. K. Mitra and K. S. Krishnan had been elected vice presidents, and that M. N. Saha was the new director.

S. N. Sen

Indian Association for the Cultivation of Science, Jadavpur, Calcutta 32, India

Science News

After **100 yr of Riemannian geometry,** the *Physikalische Blätter* (**10,** 296) has reproduced excerpts from Riemann's famous paper on the hypotheses that are the foundations of geometry. This lecture was delivered on 11 June 1854, and opened a whole new field of geometry and mathematics; it became particularly important in Einstein's general theory of relativity. In addition to the excerpts, the journal also presents a commentary by Karl F. Strubecker.—K. L. H.

The Food and Agriculture Organization of the United Nations has determined that **world food production** is rising faster than population increase for the second season in succession. There are surpluses in some regions and continued shortages and widespread malnutrition in others. Two problems in particular are matters of serious concern to the FAO: (i) How to reduce existing surpluses without unbalancing the trade in agricultural commodities. (ii) How to insure continued agricultural expansion on a selective basis with respect to countries and products in order to improve world nutrition as a whole.

The surpluses that exist are principally in North America and consist chiefly of grain. The rise in total agricultural production is greatest in Western Europe and the Near East, with smaller gains in the Far East and Oceania. Food production expanded faster than population in all the less well-fed regions except Latin America.

Phlebitis, forerunner of the often fatal pulmonary embolism, can be detected early by a simple test announced by Robert I. Lowenberg of New Haven, Conn., in a recent issue of the *Journal of the American Medical Association.* The pneumatic cuff of a blood pressure instrument is wrapped around the calf or thigh, instead of the arm, and is slowly distended. If the patient has phlebitis, he will "complain bitterly of pain" when the instrument registers somewhere between 60 and 150 mm of mercury. Usually patients do not register discomfort below 180 mm over the thigh or calf, and most can stand 250 mm on the arm without complaint. False positive tests may occur at times, but in some 350 patients Lowenberg has not had any false negative tests. No patient who had a negative test developed thrombophlebitis or pulmonary embolism.

Nineteen British doctors have left London for a 3-wk **visit in Russia.** The trip is sponsored by the British Society for Cultural Relations with the U.S.S.R. The group included T. F. Fox, editor of the medical magazine *Lancet*; Lord Amulree, president of the Medical Society for the Care of the Elderly; and Esther Killick, professor of physiology at the University of London.

A **desert plover** was found recently at the Ottenby bird station on the Baltic island of Gotland. The bird, a native of the Central Asiatic salt plains, is very rare outside its natural habitat, only seven finds having previously been recorded in Europe and Western Asia.

It is generally believed that all adult vertebrates possess a respiratory blood pigment, hemoglobin, contained in special cells, the erythrocytes. Hence the discovery of an exception to this rule is of considerable interest. Johan T. Ruud [*Nature,* **173,** 848 (8 May 1954)] reports on the blood of three species of fish, *Champsocephalus gunnari, Pseudochaenichthys georgianus,* and *Chaenocephalus aceratus,* of the family Chaenichthyidae. These three species, native to the waters of South Georgia Island in the South Atlantic, all have **colorless blood.** The existence of such fish has been known for over 20 yr, but no previous study of their blood appears to have been made.

Ruud studied the blood of *Chaenocephalus aceratus* in detail. When freshly drawn it is nearly transparent, slightly tinted yellowish-white. No cells resembling erythrocytes were found in blood smears stained after May-Grünwald and Giemsa. No blood pigment could be demonstrated; there was no absorption band in a spectrum. After centrifugation the plasma was as clear as water. The iron content of the blood is low, being no more than 4–5 percent of that found in various red-blooded fish. This supports the view that *C. aceratus* blood represents a plasma with a moderate content of leucocytes. Oxygen capacity of the fresh blood averaged 0.72 percent by volume; mean values found for the normal red blood of two local species of fish were 5.99 and 6.24, similar to those of northern fish. The O_2-capacity of *C. aceratus* blood being presumably no greater than that of ordinary red-blood plasma, it follows that it has no means of taking up O_2 except by physical solution. The actual metabolism of *C. aceratus* was not determined; the fish, however, appeared quite sluggish and sensitive to lack of O_2.

Since it can be assumed that these fish are descended from ancestors possessing blood hemoglobin, there arises the question of how they came to lose their blood pigment. Ruud thinks that such fish could survive only in the cold water of polar regions. The *Chaenocephalus* specimens came from water that can be as cold as −1.7°C. and is always well aerated. These seas may well have long been cold, even throughout Tertiary times.

In an appended note, H. Munro Fox points out that carp, pike, and eels have been found to be much less sensitive to carbon monoxide than is man, even though it converts nearly all of their hemoglobin to carboxyhemoglobin. He concludes that although blood hemoglobin is a necessity for some fishes, many other fishes when swimming quietly secure enough O_2 by solution in the blood plasma. The hemoglobin of such fishes represents only an emergency precaution. Evidently the "ice fish," as Fox notes, are even able to dispense with this luxury.—W. L. S., Jr.

Joseph M. Hopen and Francis N. Campagna, eye specialists at Philadelphia General Hospital, have been using injections of the digestive enzyme **trypsin to treat black eyes.** The treatment was successful in five cases, and also gave "impressive" results in seven cases of other eye conditions, including hemorrhage of the retina which caused sudden loss of vision.

The **Australian weather station** at Heard Island in the subantarctic regions 2500 mi southwest of Perth, Western Australia, is being abandoned this summer. Buildings and equipment on Heard Island will be used to expand Australia's new research station at Mawson in Antarctica; however, a basic establishment of buildings and supplies will remain on the island so that it may serve as a staging camp for future expeditions.

Clarence T. Shoch, head of the 33,000-member National Society of Professional Engineers, has criticized the action of the House-Senate conferees on the **Social Security expansion bill** in deciding to force self-employed professional engineers into the social security system, while excluding other major professions. The House bill provided mandatory coverage for all self-employed professionals except doctors. The Senate version continued the present exclusion of all self-employed professionals. The compromise provided mandatory coverage for self-employed professional engineers, architects and accountants, but continued the exclusion of lawyers, and doctors, dentists, and others in professions allied with medicine.

The objection of the professional engineers to mandatory coverage rests primarily on the same ground as

the opposition of the other professional groups—because the self-employed professional generally does not retire at the age of 65 yr and will not receive the retirement benefits after that age (until the age of 72) if he earns more than the small amount per year prescribed in the new bill ($1200 per yr).

William P. Longmire, professor of surgery at the University of California at Los Angeles Medical School who has just returned from Germany after a 2-yr leave of absence, reports that there are 6000 **unemployed doctors in West Germany.** Despite the general prosperity in West Germany unemployment among physicians is high, primarily because of the large influx of doctors from East Germany. Longmire commented that West German medical care is excellent, and that there are many well-equipped hospitals.

Lawrence Swan, biologist member of the 10-man American expedition to Mount Makalu in the Himalayas, recently reported that the group's entomologic studies and collections had established the discovery "of the **highest animal level in the world.**" Spiders were found living at a height of 20,000 ft and small snails at 16,000 ft. The expedition to the 27,700-ft mountain was sponsored by the University of California and led by William E. Siri.

Experiments that may lead to the use of supersonic waves in the treatment of some brain and mental diseases were reported by William J. Fry, John W. Barnard, and Rolfe F. Krumins of the University of Illinois at the recent meeting of the American Physiological Society. These investigators have used **supersonic waves to destroy brain tissue** in an area as small as 1/20 in. across without affecting blood vessels and without affecting tissues around, above, or beyond the spot. Only a few further tests are needed before this method can be tried on human patients. The frequncy used is 1 Mcy/sec, 50 times higher than the highest audible frequency. The beam is sent through a salt solution in contact with both sound source and the brain. The latter is exposed through an opening cut through the skull but not through the protective membrane covering the brain.

The Atomic Industrial Forum, of 260 Madison Ave., New York 16, has recently initiated a survey of the types of materials, equipment, and skills most likely to be required by the **atomic energy industry** during the next few years, together with an analysis of the magnitude of the demand for each. The Forum entered into a study agreement with the U.S. Atomic Energy Commission to facilitate the conduct of the survey. The survey is divided into three sections, private nuclear research and development, radiation instrument manufacture, and reactor development. Data on the first two sections are being obtained by means of questionnaires that have been mailed to 1000 institutions (including 75 radiation instrument manufacturers) active in or interested in the private development of atomic energy and its by-products. This information will be supplemented by interviews with selected industrial leaders active in the field. The reactor development section of the survey will be handled through a review of background information in AEC files, and through interviews both with contractors responsible for AEC's 5-yr reactor development program, and with various participants in AEC's industrial participation program.

The study team is made up of Frederick Warren of General Dynamics, former deputy director of AEC's division of construction and supply; James Pickard, a private consultant in atomic energy developments, formerly with AEC's division of reactor development; and Edwin Wiggin, Forum manager of technical information, formerly with AEC's isotopes division. The assembled data will be published and made available to all interested persons. Since no study of this type has ever before been conducted, the Forum believes that the information, will prove invaluable to industry in gaging its future plans in atomic energy development.

John C. Dunegan, plant pathologist of the U.S. Department of Agriculture, recently reported to the American Phytopathological Society that fruit trees are being protected from fire blight by antibiotic spray. In the first successful large-scale commercial **orchard trial of terramycin and streptomycin sprays,** 98 percent control of fire blight, which causes annual losses of $70,000,000, was obtained in tests at Marysville, Calif. These antibiotics are also being used on hitherto uncured bacterial diseases of tomatoes, peppers, beans, walnuts, and potatoes.

Government scientists on a small, somewhat remote island near Beaufort, N. C., will soon begin investigation of the possibility that H-bomb explosions at sea might make it very dangerous to eat tuna and other large ocean fish. The investigation is the outgrowth of the 1 Mar. H-bomb test that injured fishermen and **contaminated tuna** on a Japanese vessel. The Japanese tuna industry was hit hard when foreign importers became suspicious of all fish from the area. The new project, under Walter A. Chipman, will attempt to discover how quickly and to what extent fish collect dangerous radiation, and in what manner they do so.

Donald Thomas Fraser (1889–1954), associate director of the Connaught Medical Research Laboratories and the School of Hygiene, University of Toronto, died suddenly on 20 July in Santiago, Chile, while making a tour of South American medical schools and schools of public health at the request of the World Health Organization and under the auspices of the Pan American Sanitary Bureau.

Dr. Fraser obtained the B.A. degree at the University of Toronto and then graduated in medicine. After an interval of military service abroad, he returned to Canada in 1918 to join the staff of the Connaught Laboratories as bacteriologist, subsequently being appointed research associate and assistant director. In

1920 he was appointed to the staff of the department of hygiene and preventive medicine in the faculty of medicine, attaining the rank of professor in 1932 and head of the department in 1940. Dr. Fraser contributed much to the successful development of the school, of which he was appointed associate director in 1942.

Bacteriology and imunology were Dr. Fraser's fields and he made many important contributions. He early became interested in the control of diphtheria, and his studies included the transmission of the disease by carriers, types of organisms, the value of diphtheria toxoid in prevention, and the necessity of a recall dose in producing prolonged immunity. The control of diphtheria is one of the most remarkable achievements in the history of public health in Canada, and Dr. Fraser had a large share in this accomplishment. He was keenly interested also in tetanus, scarlet fever, and whooping cough. As professor of hygiene and preventive medicine, he developed the present courses of instruction, which extend over the whole 4 yr of undergraduate teaching. His influence as a teacher was felt far beyond the University of Toronto.

Dr. Fraser was internationally known for his work in preventive medicine and allied fields. He was president of the American Association of Immunologists in 1938–39 and of the American Epidemiological Society in 1948. He served the American Public Health Association as a member of several committees, including the Lasker Awards Committee, the Committee on Research and Standards, and the Subcommittee on the Control of Communicable Diseases. He was a fellow of the Royal Society of Canada and a senior member of the Canadian Public Health Association, as well as a member of the editorial board of the association's journal.

Scientists in the News

The University of Minnesota has announced the posthumous award of its "Builder of the Name" medal to the late **Dean Edward M. Freeman,** plant pathologist who for 25 yr headed the university's college of agriculture, forestry, and home economics. In a citation accompanying the medal, Dean Freeman is described as a "dynamic teacher in lecture hall, field and laboratory—revered for his devotion to the highest educational standards—beloved by students for his wise and generous counsel." Associated with the university as student, teacher, and administrator for almost half a century, Freeman, in 1907, organized the university's department of plant pathology, said to have been the first in this country. Dean Freeman, who retired in 1943, died 5 Feb. 1954.

Winners of Albert Lasker awards in rehabilitation are **Henry H. Kessler,** medical director, Kessler Institute for Rehabilitation, West Orange, N.J.; **Juan Farill,** chief surgeon of the Shriner's Hospital for Crippled Children, Mexico City; and **William Richard Morris,** Viscount Nuffield, Oxford, England.

The appointment of **Sidney N. Sadoff,** formerly of the H. K. Ferguson Co., as technical director of foreign operations of Bristol Laboratories, Inc., has been announced.

A bronze bust of **Albert Schweitzer,** philosopher, musician, theologian, and physician, has been presented to the University of Wisconsin by a group of hospital staff members and other Wisconsin residents. The bust, which is the work of Louis Mayer, was unveiled in August in the lobby of University Hospitals. A plaque on the bust reads:

> Versatile scholar in theology and philosophy. Distinguished contemporary interpreter of Bach. Founder and for 40 years missionary surgeon of the hospital at Lamberene, French Equatorial Africa. By his surpassing achievements in the service of God and his fellow men, Doctor Schweitzer has pointed the way to a full life in medicine. In his example the weak will find strength, and the stalwart, renewed courage and resolution.

Charles D. Shields, formerly physical medicine consultant, with the rank of colonel, in the professional division of the Office of the Surgeon General, U.S. Army, has been appointed professor and chairman of the department of physical medicine and rehabilitation at the Georgetown University School of Medicine.

Russell B. Stevens has been appointed executive secretary of the Biology Council of the Division of Biology and Agriculture, National Academy of Sciences–National Research Council, effective 15 Oct. Stevens is a plant pathologist who took his Ph.D. degree at the University of Wisconsin in 1940. He has been a teacher at three southern institutions and recently published a textbook, *Disease in Plants,* on which he collaborated with his father, Neil E. Stevens, now deceased. Associated with the Biology Council is the new committee on educational policies, which is under the chairmanship of **Howard M. Phillips,** dean of the Graduate School, Emory University.

In the Division's Food and Nutrition Board, **Paul E. Johnson** has been appointed executive secretary of the Food Protection Committee. Johnson has been with the agricultural relations division of the Tennessee Valley Authority and has had extensive experience in the field of animal and human nutrition.

On 1 July **W. F. Swanson** was named dean of the School of Dentistry of the University of Pittsburgh, where he will continue as professor of oral histology and embryology. He is a specialist in the role of vitamin C in tooth structure.

David G. White joined the pomology staff of the department of horticulture, Rutgers University, on 1 Aug. to serve as visiting professor while on sabbatical leave from the department of horticulture at Pennsylvania State University. He will help advise the 15 graduate students in pomology, complete a book on plant science techniques, teach a course in the latter

subject, and initiate research in better preservation of soft fruits at the harvest.

The Office of International Relations, National Academy of Sciences—National Research Council, has provided the following information concerning the travel plans of **scientific visitors** to the United States:

R. W. Cooke, Building Research Station, Department of Scientific and Industrial Research, Garston, near Watford, Herts, England. Arrived 22 Sept. for 1 yr on staff of United Kingdom Scientific Mission to conduct liaison work on Building Research.

H. P. Donald, director of the Agricultural Research Council's Animal Breeding Research Organization, Edinburgh. Here from 7 Sept. until early December.

W. H. Glanville, director, and R. L. Moore, (principal scientific officer), Road Research Laboratory, London. Here 14 Oct. for 5 wk to attend the Canadian Good Roads Association meetings, 8–10 Nov., and to make various visits.

A. Goldberg, Medical Research Council, London. Here in September on an Eli Lilly traveling fellowship to spend 1 yr at the department of medicine, University of Utah and Salt Lake General Hospital.

R. H. Heptinstall, Medical Research Council, London. Here in September on an Eli Lilly traveling fellowship to spend 1 yr in the department of pathology, Johns Hopkins Hospital, and in making various visits.

A. C. Hulme, Ditton Laboratory, East Malling, Kent, England. Here this fall for 1 yr at Cornell University to conduct research on the metabolism of amino acids and proteins in fruit with Prof. F. C. Steward.

W. A. Langmead, principal physicist, St. Thomas' Hospital, London. Here 28 Aug.–27 Oct. with Dr. Fleming, radiotherapist from the same hospital, to inspect hospital equipment with particular reference to radiocobalt teletherapy, and to study other applications of radioactive isotopes to medical problems.

K. McCarthy, Medical Research Council, London. Here in September on an Eli Lilly traveling fellowship to spend 2 yr at the Children's Hospital, Boston.

G. T. Mills, Medical Research Council, London. Here in September on an Eli Lilly traveling fellowship to spend 1 yr at the department of biochemistry, Western Reserve School of Medicine.

J. N. Morris, director, Medical Research Council's Social Medicine Research Unit, London. Here 11 Sept.–3 Nov. to attend the International Congress of Cardiology.

H. J. H. Starks, head, Vehicles Section, Traffic and Safety Division, Road Research Laboratory, Harmondsworth, West Drayton, Middlesex, England. Here 22 Sept. for 6 mo of liaison work on road research as a staff member of the United Kingdom Scientific Mission.

C. P. Stewart, head, Department of Clinical Chemistry, Royal Infirmary, University of Edinburgh. Will visit medical schools and other research centers in the United States and Canada during September, October, and November. Address care of Dr. Floyd Daft, National Institutes of Health, Washington, D.C.

J. H. Wilkinson, principal scientific officer, Mathematics Division, National Physical Laboratory, Teddington, Middlesex, England. Arrived 10 Sept. for 3 mo at the National Bureau of Standards. Is interested in the current trend and development in the construction of high-speed computing machines.

Dr. Moran and Mr. Wooler, Flour Millers Research Association. Here in October to obtain first hand knowledge of flour milling research and development.

F. Weinberg, Department of Chemical Engineering and Applied Chemistry, Imperial College of Science and Technology, London. Arrived 29 Aug. to attend the 5th International Symposium on Combustion at the University of Pittsburgh. Various other visits; departure date indefinite.

Mahapitiyage V. P. Peiris, coprofessor of surgery, University of Ceylon, and visiting surgeon, General Hospital and Lady Ridgeway Hospital, Colombo. Arrived 28 Aug. for 90 days. Sponsored by American Council on Education.

August Rucker, president, Munich Technical University, Munich, Germany. Arrived 31 Aug. for 60 days. Sponsored by American Council on Education.

Meetings

On 8 Oct. at the Hospital of the University of Pennsylvania, Philadelphia, a symposium on **Anthrax in Man** will be held under the joint sponsorship of the Department of Health, Commonwealth of Pennsylvania, the Department of Public Health, City of Philadelphia, and the School of Medicine, University of Pennsylvania. All interested parties are invited to this one day symposium. There will be no registration fee. Further information may be obtained from Dr. Harry E. Morton, School of Medicine, University of Pennsylvania.

A tentative program of 85 titles has been announced for the 28th annual fall meeting of the **American Oil Chemists' Society,** to be held in Minneapolis, 11–13 Oct. There will be four symposiums: drying oils, waste disposal, utilization of surfactants, and analytical techniques. General chairman is James C. Konen of Archer-Daniels-Midland Co., Minneapolis.

The seventh annual **Gaseous Electronics** conference, bringing together some 300 physicists from the United States and foreign countries, will be conducted at New York University, 14–16 Oct. The division of electron physics of the American Physical Society is cosponsor with N.Y.U. of the conference, which is being held in conjunction with the celebration of the centennial of the university's College of Engineering. About 50 papers on technical subjects in the physics of gas discharge phenomena will be presented.

Delegates from abroad this year will include the physicists F. Llewellyn Jones of the University of Swansea, South Wales, and T. E. Allibone, director,

Research Laboratories, Associated Electrical Industries, Ltd. Chairman of the conference is W. P. Allis of Massachusetts Institute of Technology.

A symposium on **Nutritional Aspects of Blood Formation,** made possible by a grant from the National Vitamin Foundation, will take place at the University of Cincinnati College of Medicine on 22 Oct. Proceedings will be published by the foundation.

The 3rd biennial symposium, sponsored jointly by the Philadelphia and Wilmington **organic chemists' clubs,** will be held in Philadelphia on 28 Oct. at the University of Pennsylvania Museum Auditorium. The principal speakers are E. J. Corey, University of Illinois; A. C. Cope, Massachusetts Institute of Technology; A. D. F. Toy, Victor Chemical Works, Chicago; and A. R. Todd, Cambridge. For information write to William Langeland, Pennsylvania Salt Manufacturing Co., Research Laboratory, Wyndmoor, Pennsylvania.

Because extensive advances in many aspects of biological oceanography have been made since the last comprehensive general review 12 yr ago, the American Institute of Biological Sciences Committee on Hydrobiology, advisory to the Office of Naval Research, has undertaken a program calling for a series of reviews by prominent specialists. The initial phase of this program will be a symposium of five subjects presented at the AAAS meeting in Berkeley, Calif., 26–31 Dec.

The American Society of Limnology and Oceanography and the Ecological Society of America are cosponsoring this symposium on **"Recent advances in biological oceanography."** The following topics will be reviewed under the chairmanship of Robert W. Hiatt: (i) distribution of nutrients in the equatorial central Pacific Ocean by Townsend Cromwell and Thomas Austin; (ii) fluctuations in clupeoid fish populations by John C. Marr; (iii) sound scattering in the ocean by Gordon H. Tucker; (iv) ecologic adaptations to cold by Arctic marine organisms by Norman Wilimovsky; and (v) sound production by marine organisms by Marie Poland Fish.

More than 500 chemists from all over the nation gathered at the University of Illinois on 3 Sept. to honor **Roger Adams,** head of the university's chemistry department for 28 yr, who on 1 Sept. retired from that post to devote full time to research. Adams was described by Ernest H. Volwiler, president of Abbott Laboratories, Chicago, as "the keystone of a faculty group which, particularly in organic chemistry, is second to none in the world." Volwiler was in 1918 the first of 172 persons who have since earned their doctoral degree in chemistry at Illinois under Adams' direction. Volwiler opened a 2-day symposium at which five other Adams alumni presented technical papers.

For more than 30 yr Adams, who is a past president of AAAS, has averaged a scientific paper a month—375 all told. Among his scientific achievements are the isolation of gossypol, the complex pigment in cottonseed that defied chemists for many years; isolation of the principal of marijuana and synthesis of a compound 70 times as active; synthesis of a chemical for treating leprosy; development of a catalytic agent—platinum oxide—so useful to the chemical world it is often called "the Adams catalyst"; participation in the synthesis of the pain-killing drug procaine when desperately needed during World War I; and development of a sneezing gas "Adamsite" for the U.S. Army.

Early this month industry met with federal and state health authorities in Washington for the first national conference on **shellfish sanitation** to be held since 1925. Officials of about 20 states and the Dominion of Canada were among the participants. The plans of Japan, France and other countries to export shellfish to the U.S. necessitate discussion of protective health controls. Domestic problems stem from recent developments in breeding and freezing processes, growth of towns in proximity to shellfish-cultivation areas, and improvement of sewage-treatment facilities in coastal regions previously closed to shellfish production because of pollution hazards.

A new organization called the **Society of Technical Writers** has been founded. In the first issue of its official publication, *Technical Writing Review,* the society lists its aims: (i) developing and establishing standards for technical writing; (ii) stimulating the exchange of information of common interest in this and allied fields; (iii) encouraging the development and training of technical writers; (iv) acquainting others with the profession.

At the first annual meeting in May, Paul H. Flint succeeded Floyd Hickok as president. Other officers elected were v. pres. Ronald B. Eames; treas., Ralph Fullerton; and sec., Hyman Kana. In addition to the retiring president, Robert K. Schritzler and John V. E. Hansen became members of the executive board.

To foster growth, a plan has been formulated to enable distant members to become active in the society. Interested persons are urged to communicate with the Society of Technical Writers, 28 Newbury St., Boston 16, Mass.

Education

Only three universities—the University of Illinois, Johns Hopkins University, and the University of Pittsburgh School of Health—offer graduate programs in **bioclimatology,** the new name for science dealing with the effect of physical environment on human beings, animals, and plants. However, a few courses are given elsewhere in this country and more work is being done in Germany. While the demand for persons with this type of training is chiefly in the government and in teaching, indications are that such persons may be sought by industry as more is learned about the field.

Veterinary Corps officers of the Army and the Air Force will receive special training in evaluating the **effects of ionizing radiation** from atomic weapons on foods and food producing animals. The 2-wk course, which is the first of its type to be offered in the United States, will be conducted at the Oak Ridge Institute of Nuclear Studies. The curriculum includes biological aspects of radiation phenomena, dosimetry, radiobioassay in animal tissues, radiation syndromata in the domestic animals, and disposition and salvage of radiocontaminated foods.

Harvard University has received a 5-yr grant of $275,000 from the Rockefeller Foundation for the purpose of integrating the teaching of comprehensive medical care into the medical school curriculum. Medical students will be assigned to families living in the vicinity of, and now receiving medical care from, the Massachusetts General Hospital and related community agencies. The program is to be directed for the Harvard Medical School by a policy committee representing Harvard Medical School, Massachusetts General Hospital, and Boston Lying-In Hospital. Joseph Stokes, III, instructor in preventive medicine at the Harvard Medical School and clinical assistant in medicine at Massachusetts General Hospital, will head the program staff under the general supervision of the chairman of the policy committee, David D. Rutstein, professor of preventive medicine at Harvard.

The **Jesse H. Jones Medical Library of the Texas Medical Center,** Houston, was dedicated with appropriate ceremonies on 9 Sept. This library, developed by the Houston Academy of Medicine, is housed in a large building that also contains an auditorium and special lounges for the health professions. The dedication address was given by Chauncey D. Leake, executive director of the University of Texas Medical Branch, Galveston.

Illinois Institute of Technology will offer for the first time this fall a new course in **nuclear engineering.** The course is designed to instruct engineering graduates in the fundamentals of radioactivity and the manipulation and control of atomic energy. It will be taught by Walter Fagan, who helped develop the atomic-powered submarine *Nautilus.*

Construction of the new $340,000 **Rich's Electronic Computer Center** has begun at the **Georgia Institute of Technology.** The center will be the largest and most complete of its type in the South, and the first of its kind in a southern educational institution. The project has been made possible by a grant of $85,000 from the Rich Foundation of Atlanta, and an additional $85,000 from the Georgia Tech Research Institute. A $170,000 building to house the center is being provided through the University System Authority of Georgia.

Because of the great demand for the services of an electronic digital high-speed computer, a medium-sized, general purpose instrument will be purchased and put into operation as soon as possible in temporary space to be provided by the institute's Engineering Experiment Station. Later, a larger and more powerful computer will be constructed.

The services of the two computers will be made available to southeastern industry and business through the Georgia Tech Research Institute. The actual operation will be under the direction of the Engineering Experiment Station, assisted by the personnel of the School of Mathematics.

The **School of Tropical and Preventive Medicine of the College of Medical Evangelists** has announced the expansion and change in name of the former department of ichthyology and herpetology. The new division will be called the department of biotoxicology, and will include laboratories in histology, pharmacology, chemistry, taxonomy, toxicology, ichthyology, herpetology, and botany. The department's extensive library on poisonous and venomous marine organisms will ultimately be expanded to include other types of poisonous and venomous organisms.

Research areas of particular interest are: (i) poisonous and venomous organisms and their relationship to military and preventive medicine; (ii) The relationship of poisonous marine organisms to the development of new protein food sources from the sea; (iii) screening of organic compounds from natural products and an evaluation of their application to industry and medicine. The research program will be headed by Bruce W. Halstead, head of the department, who will continue his research in medical ichthyology.

A 3-ton, $42,000 mass spectrometer has been added to the research facilities of the **University of Michigan.** The fourth spectrometer of its kind in the nation owned by a university, it has been installed in the chemical and metallurgical engineering department of the College of Engineering, where it will be under the direction of David M. Brown.

Available Fellowships and Awards

Argonne National Laboratory has announced that applications for temporary research appointments at the Laboratory for the next academic year will be accepted until 15 Dec. Positions are available in biology, chemistry, engineering, medicine, metallurgy, and physics. The Laboratory reserves temporary positions each year for members of university and college faculties who will return to their academic institutions after the temporary residence at the laboratory.

Appointments will ordinarily be made for a period of approximately 1 yr although applications for the summer, or for other periods less than a year, will be considered in cases where useful results can be anticipated in the shorter time. Each applicant must be endorsed by his own academic institution. Further information may be obtained from J. C. Boyce, Associate Laboratory Director, Argonne National Laboratory, Box 299, Lemont, Ill.

On behalf of the **James Picker Foundation,** the National Academy of Sciences–National Research Council announces the continued availability of funds in support of radiological research during 1955–56. Applications are reviewed by the Committee on Radiology of the NAS–NRC's division of medical sciences. Final determination of awards is made by the foundation upon recommendation of the committee. The foundation has expressed particular interest in the support of studies oriented toward the diagnostic aspects of radiology. Awards are not restricted to citizens of the United States.

Grants-in-aid are designed to encourage research offering promise of improvement in radiological methods of diagnosis or treatment of disease. *Applications must be submitted on or before 30 Nov.*

Grants for scholars are a transitional form of support, designed to bridge the gap between the completion of fellowship training and the period when the young scientist has thoroughly demonstrated his competence as an independent investigator. A grant of $6000 per year will be made directly to the scholar's institution as a contribution toward his support, or his research, or both. Initial grants are limited to 1 yr, but renewal may be recommended. Applications should be submitted by the institution on behalf of the candidate *prior to 30 Nov.*

Fellowships in radiological research, available under the program of the foundation, have been announced separately [*Science* **120,** 449 (17 Sept. 1954)].

Further details and application blanks may be obtained from the Division of Medical Sciences, National Academy of Sciences–National Research Council, 2101 Constitution Ave., NW, Washington 25, D.C.

Grants and Fellowships Awarded

The **Campbell Soup Co.** has made a grant of $6000 to **Rutgers University** to study the need for maintaining a proper balance of the minerals, sodium, potassium, calcium, and magnesium in soils used for producing tomatoes. This work will be carried out by the university's department of soils at the New Jersey Agricultural Experiment Station.

Columbia Ribbon and Carbon Manufacturing Co., Inc., Glen Cove, N. Y., has awarded a $5000 research contract to **Adelphi College** to support research in the field of duplication processes, centering specifically on the problem of permanency in spirit hectography. The ultimate aim of the project is to produce a hectograph ink that will not fade over a period of time.

The first **Drummond fellowship in nutrition** has been awarded to Iain MacIntyre at the Postgraduate Medical School of London. The Drummond fellowships are endowed from the proceeds of a recent appeal in memory of the late Sir Jack Drummond.

Eli Lilly and Co. has announced these research grants.

University of Chicago. J. B. Kirsner, dept. of medicine. Peptic ulcer in relation to certain hormonal and enzymologic aspects.

Cornell University. T. P. Almy, dept. of medicine. Neurohumoral mechanisms in intestinal motility.

University of Illinois. Fellowship for dept. of chemistry.

University of Louisville. M. M. Best, dept. of medicine. Atherosclerosis and cholesterol metabolism.

University of Minnesota. P. S. Hagen, dept. of medicine. Relationship of vitamin B_{12} and intrinsic factor.

New York University. H. Doubilet, College of Medicine. Effect of Paveril Phosphate and related substances in relaxing the sphincter of Oddi.

New York University. C. F. Wilkinson, Jr., Post-Graduate Medical School. Ilotycin.

St. Luke's Hospital, New York. T. B. Van Itallie, dept. of medicine. Glucagon-induced hyperglycemia as an index of liver function, and glucagon in the peripheral uptake of glucose.

University of Washington. E. H. Fischer, dept. of biochemistry. Structure of crystalline amylases.

Western Reserve University. E. W. Sutherland, School of Medicine. Mechanism of the action of hormones, primarily the hyperglycemic factor and epinephrine.

The **Hematology Research Foundation** of Chicago has announced the following awards.

Fellowships

Bracha Ramot, Michael Reese Hospital, Chicago, the Ruth Berger Reader fellowship.

Sheldon J. Horowitch, Michael Reese Hospital, Chicago, a fellowship in hematology.

Grants

H. L. Alt, Northwestern University Medical School. *In vitro* and *in vitro* studies of the bone marrow function in man by chemical and isotopic techniques, $3000.

F. E. Trobaugh, Jr., Presbyterian Hospital. Free and filter paper electrophoretic studies of serum and urinary proteins in various hematologic disorders, $3600.

Y. Matoth, Hebrew University-Hadassah Medical School, Israel. Pathogenesis of anemia in acute leukemia, $1500.

The **John Simon Guggenheim Foundation** has announced the award of the following 24 fellowships in the American republics, Puerto Rico, and the Philippines.

Gerardo Offimaria Ocfemia, College of Agriculture, University of the Philippines, Laguna. Transmission of plant diseases by insects.

Mario Meneghini, Biological Institute, São Paulo, Brazil. Mechanism of multiplication of plant viruses.

Alfonso Trejos-Willis, dept. of protozoology, University of Costa Rica. Diseases transmitted by fungi.

Americo Pomales-Lebron, dept. of bacteriology, University of Puerto Rico School of Medicine, San Juan. Medical bacteriology, with special reference to brucellosis.

Lauro Sollero, dept. of pharmacology, School of Medicine and Surgery, National University of Brazil, Rio de Janeiro. Pharmacology in relation to problems of cardiology.

Carlos Eyzaguirre Edwards, dept. of neurophysiology, Catholic University of Chile, Santiago. Physiology of the nervous system.

Raulino Reitz, Herbarium Barbosa Rodrigues, Itajai, Brazil. Botany with particular reference to the trees of the state of Santa Catarina, Brazil.

Jorge Helios Morello Wyler, dept. of plant physiology, University of Tucuman, Argentina. Comparative studies of shrubs common to desert regions of North and South America.

Gustavo Fuertas Gonzales, dept. of botany, Menor Claretiano Seminary, Bosa, Colombia. Paleobotany.

Alfredo Pacyaya, St. Mary's School, Sagada, Mountain Province, Republic of the Philippines. Life and culture of the Mountain Province peoples of the Philippines.

Lauro José Zavala, Honduran National Institute of Anthropology and History, Tegucigalpa, Honduras. The early cultures of Honduras.

Juan Caudmont, Colombian Institute of Anthropology, Bogotá, Colombia. Linguistic study of the native languages of Colombia.

Silvio Diaz Escobar, Clinical Hospital, Asunción, Paraguay. Surgery with special reference to cancer.

Orlando Fals-Borda, Bogotá, Colombia. Mingling of Spanish culture and the culture of the Chibcha in Colombia.

Felix Gonzalez Bonorino, dept. of geology, University of Buenos Aires. Geology with special reference to the development of new techniques for locating mineral deposits.

Teodoro G. Megia, Bureau of Fisheries, Department of Agriculture and Natural Resources, Republic of the Philippines. Oceanography with particular reference to problems of fisheries.

William H. Partridge, Argentine Museum of Natural Sciences, Buenos Aires. Birds of northeast Argentina, southeast Brazil, and eastern Paraguay.

Renato Lion de Araujo, Biological Institute, São Paulo, Brazil. Neotropical termites.

Pedro Wygodzinsky, Miguel Lillo Institute and National University of Tucuman, Argentina. Taxonomic studies of the insect subfamily Emesinae.

Paulo Erichsen de Oliveira, division of geology and mineralogy, National Dept. of Mineral Production, Rio de Janeiro. Fossils of the Cretaceous-Tertiary of Brazil and of the North American Atlantic coast.

Jorge A. Crespo, Argentine Museum of Natural Sciences, Buenos Aires. Ecology and distribution of Argentine mammals.

Manuel García Morin, dept. of chemistry, University of Puerto Rico, Rio Piedras. Nuclear magnetic resonance of certain chemical compounds.

Norberto José Palleroni, Institute of Microbiology of the National University of Cuyo, Mendoza, Argentina. Biochemistry of microorganisms.

Victor Manuel Blanco, dept. of astronomy, Case Institute of Technology, Cleveland, Ohio. Red supergiant stars in certain areas of the Milky Way.

The **Minneapolis-Honeywell Regulator Co.** has announced that two new postgraduate fellowships for engineering and physics students have been set up with Purdue University and Tau Beta Pi. For the past several years, Honeywell has established at least one new fellowship annually, and these last bring to seven the total number offered by the company.

The **Philadelphia College of Pharmacy and Science** has announced the receipt of more than $80,000 from the estate of the late **Gustavus A. Pfeiffer,** formerly president of William R. Warner and Warner Hudnut, Inc., of New York City. The legacy was given as a tribute to the organization's work in research and teaching. It has also been announced that the fund drive initiated by the college a little over a year ago has now resulted in contributions of more than $1.5 million, an amount that does not include regular gifts received for the maintenance of the college. Ninety percent of the special fund came from alumni, 40 percent of whom made pledges and contributions.

In 1821 the Quaker founders of the college had written into the constitution that the corporate body was never to solicit or receive aid from the state, and the college has kept faith with that trust. In the past 10 yr it has, without benefit of outside collecting organizations, brought into the holdings of the college something in excess of $3 million.

The annual **Robert Scripps fellowship in biology** for 1954–55 has been awarded to June Mahon by the Zoological Society of San Diego. The problems that will concern her include a survey of internal parasites of zoo mammals and birds, with special reference to tapeworms, and the study of parasites of Central and South American animals.

Following are the second-quarter grants recently announced by the Rockefeller Foundation.

Harvard Medical School. Family treatment plan for broadening the training experience of undergraduate students and junior staff members, 5 yr, $275,000.

National Research Council. Work of Committee for Research in Problems of Sex, 3 yr, $150,000.

University of California. Research work of Virus Laboratory, 7 yr, $210,000.

University of Illinois. C. W. Kearns. Insect resistance to DDT. 5 yr, $75,000.

University of Illinois. G. W. Salisbury, dept. of dairy science. Biochemical and physiological process by which proteins are produced by animals, 6 yr, $100,000.

University of Saskatchewan. D. G. McKerracher and A. Hoffer, dept. of psychiatry. Basic studies in schizophrenia, 3 yr, $121,275.

Marine Biological Laboratory, Woods Hole, Mass. Support of research and training, $100,000.

University of Texas. Evolution in *Drosophila,* 5 yr, $100,000.

Columbia University. Lamont Geological Observatory. Marine biology research, $90,000.

Washington University. B. Commoner. Biochemistry of the determinative effects exerted by tobacco mosaic virus on the host, 5 yr, $75,000.

National Research Council. Fellowships in medical sciences, $150,000.

University of Sheffield. H. A. Krebs. Chemical mechanisms by which the living cell utilizes foodstuffs and the energy they provide, $80,000.

Columbia University. L. C. Dunn and T. Dobzhansky, Institute for the Study of Human Variation. Human genetics and heredity, 3 yr, $50,000.

Department of Health, Puerto Rico. Survey of medical and public health facilities in the Bayamon region, 18 mo, $63,500.

National Research Council Division of Biology and Agriculture. Work of Committee on Educational Policies, 3 yr, $50,000.

Ministry of Agriculture of Mexico. Scholarship program for agricultural research, 1 yr, $70,000.

McGill University. Training program of dept. of psychiatry, 6 yr, $47,250.

University of Durham, England. Training of public health engineers for West Africa, $48,000.

National University of Colombia. Equipment for medical school building, $60,000.

McGill University. D. O. Hebb. Physiological basis of psychological phenomena, 5 yr, $60,900.

New York Botanical Garden. W. J. Robbins. Basic plant biochemistry, 5 yr, $35,000.

Connecticut Agricultural Experiment Station. D. F. Jones, dept. of genetics. Genetics, 5 yr, $25,000.

University of Minnesota. Dight Institute for Human Genetics. Human genetics, 2 yr, $19,400.

University of Minnesota School of Medicine. Dept. of physiology. Mathematical biophysics, 3 yr, $19,500.

Medical Library Association. Foreign fellowships in medical librarianship, 2 yr, $15,000.

National Research Council. Work of Commission on Human Resources and Advanced Training, $12,000.

Harvard University. Laboratory of Social Relations. Methodology of attitude studies, $6000.

University of Chicago. L. R. Dragstedt, dept. of surgery. Visit to surgical centers in the British Isles and Europe, $2250.

Johns Hopkins University. E. V. McCollum. Protein chemistry, 1 yr, $5000.

Johns Hopkins University. J. E. Rose, School of Medicine. Service as visiting professor at University of Chile, $1450.

Yale University. N. J. Giarman, dept. of pharmacology. Service as exchange professor at University of Edinburgh, $1000.

Yale University. J. L. Melnick, dept. of microbiology. Visit to virus centers in Israel, $600.

Cornell University. R. D. Walk. Analysis of research materials on psychological stress, $4830.

University of California. R. L. Metcalf, Citrus Experiment Station. Mode of action of insecticides, 2 yr, $15,000.

Columbia University. M. Heidelberger. Immunochemistry, $7500.

Sloan-Kettering Institute for Cancer Research. Expenses of symposium on trace elements, $10,000.

Dartmouth College. R. P. Forster and R. W. Barratt. Cellular physiology and microbiology, $10,000.

New York University. B. D. Davis, dept. of pharmacology. Research, $6000.

University of Wisconsin. H. T. Wenham, dept. of plant pathology. Visit to agricultural, educational, and research centers in U.S., $700.

University of Illinois. G. S. Fraenkel, dept. of entomology. Visit to centers of research in insect physiology in Japan, Southeast Asia, India, and Israel, $2000.

Washington University. P. J. Campisi, dept. of sociology. Community study of Ivrea, Italy, $7500.

California Institute of Technology. H. Brown. Visit to study mineral resources of India, $4650.

Massachusetts General Hospital. R. D. Adams, dept. of neurology. To visit neurological centers in Europe, including England, $2500.

University of Pennsylvania. Exchange program with University of Stockholm, $2100.

Department of Health, Puerto Rico. J. A. Perez, Hospital Survey and Construction Bureau. Visit to medical care centers in U.S., $575.

Department of Health, Puerto Rico. E. Quintero, division of public health. Visit to medical care centers in U.S., $400.

University of Missouri. V. H. Harrison, division of nursing education. Study of university nursing schools and continuing medical and nursing education programs, $1000.

University of Toronto. Teaching and research in departments of medicine, and hygiene and preventive medicine, $29,150.

McGill University. F. C. Fraser, dept. of genetics. Human genetics, $7900.

University of Saskatchewan College of Medicine. Visit to medical education centers in U.S. and Canada by seven staff members, $6000.

McMaster University, Canada. S. S. Kirkwood, dept. of chemistry. Enzyme research, $6300.

University of Copenhagen. T. Kemp, Institute of Human Genetics. Genetics of mental defect, 5 yr, $14,200.

University of Turku, Finland. Equipment for medical faculty, $6200.

University of Paris. Travel for American delegates to colloquium on physiology of plants grown in tissue culture, $2400.

University of Naples. G. Montalenti, Institute of Genetics. Genetics, 5 yr, $28,000.

University of Pisa. G. Moruzzi, dept. of physiology. Neurophysiology, 5 yr, $25,000.

University of Utrecht. D. J. van Lennep, Institute of Clinical and Industrial Psychology. Teaching and research, 3 yr, $8900.

University of Oslo. Ø. Ødegård. Epidemiology of mental disease, 3 yr, $17,000.

University of Oslo. S. G. Laland, Faculty of Sciences. Chemistry of nucleic acids, $2000.

University of Oslo. T. Braarud. Visit to marine biology research centers in California, $660.

University of Bern. Equipment and assistance for foreign guests of Theodor Kocher Institute, 4 yr, $25,000.

University of London. B. J. Mason, Imperial College of Science and Technology. Physical and chemical properties of water, 3 yr, $18,000.

University of London. J. T. Randall, King's College. Electron microscope for research in biophysics, $6000.

British Medical Research Council. J. N. Morris, Social Medicine Research Unit. Visit to U.S. to observe work in epidemiology of chronic diseases, social medicine and teaching of preventive medicine, $1150.

St. George's Hospital, London. M. B. Powell. Visit to nursing schools and nursing service institutions in North America, $1700.

Middlesex Hospital Medical School, London. J. F. Tait. Extension of visit to centers of biophysics research in U.S. and Canada, $1100.

University of Liverpool. T. W. Goodwin. Visit to centers of biochemistry research in U.S. $1200.

St. Andrews University, Scotland. Equipment for dept. of biochemistry, $1700.

St. Andrews University, Scotland. L. W. Poel, dept. of botany. Plant physiology, $1200.

Stanley Medical College, Madras, India. A. A. Ayer, dept. of anatomy. Visit to U.S., Canada and Europe to observe trends in medical teaching and research with special reference to anatomy, $4450.

Conference of Indian medical educators. Discussion of undergraduate medical education in India, $5000.

Israel Foundations Trustees, Jerusalem. N. Goldblum. Virus studies, $10,000.

American University of Beirut, Lebanon. L. Giaccai, dept. of radiology. Visit to radiologic centers in U.S. and Canada, $2500.

Darbhanga Medical College, Bihar, India. N. L. Mitra, dept. of anatomy. Equipment, $5200.

Walter and Eliza Hall Institute of Medical Research, Melbourne. E. L. French. Visit to U.S. diagnostic and research centers in virus, rickettsial, and systemic fungal diseases, $2150.

Tokyo University Medical School. Y. Mikamo, dept. of medicine. Visit to U.S. teaching hospitals, $3100.

Otago University Medical School, Dunedin, N.Z. J. B. Howie, dept. of pathology. Visit to hematological centers in U.S. and Canada, $1750.

Otago University Medical School, Dunedin. F. H. Smirk, dept. of medicine. Visit to U.S. and Canada to observe hypertensive and cardiovascular research, and practice and teaching of general medicine, $1000.

University of the Philippines. Services of J. E. deYoung, sociologist, $5000.

Secretariat of Agriculture, São Paulo, Brazil. Equipment for Institute of Agronomy research on insect ecology, $10,000.

University of São Paulo. F. Andreazi, dept. of animal husbandry. Equipment for research in animal nutrition, $5800.

University of São Paulo. R. F. Santos, dept. of surgery. Visit to U.S. centers for teaching of surgery, $3100.

Mandaqui Tuberculosis Hospital, São Paulo. G. M. Botelho, dept. of surgery. Visit to U.S. centers of thoracic surgery, $2550.

Medical School of Pará, Belém, Brazil. M. M. Sampaio, dept of histology and embryology. Assistant professorship of Lousiana State University, $600.

University of Chile. H. A. Rodriguez, dept. of medicine. Visit to observe teaching of internal medicine in U.S., $2700.

Ministry of Agriculture, Santiago, Chile. M. Astorga C., director-general of agriculture. Visit to Mexican and Colombian agricultural programs and to New York, $2750.

Pan-American Agricultural School, Tegucigalpa, Honduras. Scholarships to agricultural colleges in U.S., $30,000.

National University of Mexico. O. H. Wheeler, Institute of Chemistry. Research, 1 yr, $4500.

National University of Mexico. L. Vazquez G., biology dept. Visit to scientific institutions and museums in U.S., $1850.

University of Cuzco, Peru. C. Vargas C. Visit to potato research centers in U.S., $2825.

University of the Republic, Montevideo, Uruguay. Faculty of Veterinary Medicine. Poultry pathology and animal genetics, $10,000.

Ministry of Public Health, Montevideo. Institute of Biological Research, Salary of secretary-librarian, 1 yr, $1000.

In the Laboratories

The opening of a new distribution center to meet the increased formaldehyde needs of chemical and textile industries in the South Atlantic States has been announced by the **Borden Co.'s chemical division.** The new center is at Kernersville, N.C.

Cornell Aeronautical Laboratory, Inc., Buffalo, has announced a major wind tunnel modernization program that will double the power of its large variable density tunnel and permit further exploration of the transonic speed range. The project, sponsored by the U.S. Air Force and administered by the U.S. Army Corps of Engineers, will cost $1,600,000. It calls for an increase from 15,000 to 30,000 hp and change to an 8 ft by 10 ft transonic throat section of Cornell's original design. The section will be used for study of airplane and missile models up to speeds 1¼ that of sound. The laboratory will spend $200,000 of its own funds on the throat modification.

Plans for construction of a $2,550,000 laboratory building for long-range and fundamental research by the **Du Pont Co.'s electrochemicals and pigments departments** has been announced. It will provide space for approximately 50 scientists to pursue research on

new products for the metals, textile, and paper industries; new venture studies based on important industrial needs; and fundamental studies of major existing products of the department. It is scheduled for completion by the end of 1955.

The **Ethyl Corp.**, New York, has announced the appointment of Richard K. Scales, former director of automotive products research, as general manager of the Detroit research laboratories and of George F. Kirby, Jr., former director of research on chemical products, as general manager of research and engineering at the Baton Rouge manufacturing plant.

A realignment of research and development work has been made in order to broaden the scope and effectiveness of Ethyl's research and technical services to the oil industry. Under the new organizational plan, all research programs in the automotive products field will be conducted at the Detroit laboratories and research and engineering on chemical products and on manufacturing processes will be concentrated at the plant in Baton Rouge.

A **laboratory for measuring and analyzing magnetic materials** was opened recently by the carboloy department of General Electric Co., Detroit. Facilities enable engineers to check designs, measure performance and efficiency of equipment, establish standards, calibrate precision magnetic assemblies, and evaluate new magnetic materials. Among the laboratory's major installations are a recording hysteresigraph and a 3000-v capacitor-discharge impulse magnetizer.

The **Nordic Mining Co., Ltd.** has announced the discovery of lead and zinc minerals worth an estimated 1 million krona ($15,000,000) at Mestersvis, Greenland. Processing of the newly found minerals is expected to start in the spring of 1956, and first shipments are scheduled to leave the Arctic that autumn. The company was founded in 1952. Shareholders are Canadian Frobisher of Toronto, the Swedish mining companies Boliden and Stora Kopparsberg, the Danish government, and various Danish enterprises. The research at Mestersvis was supported by a Danish government loan of Kr. 12,500,000 ($1,800,000).

Miscellaneous

The International Academy of Proctology announces the renewal of the postgraduate teaching fund to provide gift subscriptions to the ***American Journal of Proctology*** to 900 of the largest hospital libraries in this country and abroad. Beginning with the first issue of 1955, the journal will change from a quarterly to a bimonthly publication.

The following **chemicals** are wanted by the Registry of Rare Chemicals, Armour Research Foundation of Illinois Institute of Technology, 35 W. 33 St., Chicago, Ill.: truxillic acid; 1,2,3-butanetriol; chroman-5,6-quinone; alpha,alpha'-diphenyl-beta-pieryl hydrazil; p-ethyl acetophenone; dilaurylselenide; ethyl alpha-methlacetoacetate; methylnitrolic acid; oxalosuccinic acid; zinc hydride; dihexyl carbonate; cyanogen; cyclohexylamine dodecylphenoxy acetate; 2,4-dichlorobenzyl alcohol; potassium thioplatinate; 2,3,5,6-tetramethylbenzoic acid; 9-phenyl-2,6,7-trihydroxy-3-fluorone; dihydrophorone; diethyl germanium iodide; 3,3,3-trichloropropylene.

An English translation by Séverine H. Britt of a French paper entitled **"Contribution to the study of the physicochemical structure of clays"** (Contribution a l'étude de la structure physicochimique des argiles) by Remy Hébert, which was originally published in Annales des Mines, No. 6, p. 3–48, Paris, 1950, has been placed in open file by the U.S. Geological Survey. The translation may be consulted at the Survey library in Washington, D.C. and at the Survey library in Denver, Colo. No copies are available for public distribution.

On 30 June, a final report of a research project, **"Performance examinations for the training and selection of scientific personnel,"** was released by Haym Kruglak of the physics department at the University of Minnesota. The work was carried out under a contract with the Office of Naval Research.

The development of forest policy in three of the world's most advanced forestry nations is the subject of ***Public Policy Toward Private Forest Land in Sweden, Norway, and Finland*** by R. E. Marsh, published recently by the Charles Lathrop Pack Forestry Foundation. The foundation was organized and endowed in 1930 to promote educational and scientific work in connection with a constructive policy of forest protection and extension, and to increase public appreciation of forests as natural resources essential to the national welfare. In pursuit of these aims, it has carried on numerous studies concerned with forest resources and their management, and has published over 16 books and bulletins dealing with the subject. This latest publication is available for $1 from the foundation, 1214 16th St. NW, Washington 6, D.C.

A committee of the Washington Association of Scientists, the Washington chapter of the Federation of American Scientists, has been formed to provide the service formerly rendered by the National Committee on Atomic Information in answering **queries on atomic energy.** Bibliographies of books, periodicals, pamphlets, and films, as well as study kits, may be obtained at nominal cost by writing to the Washington Committee on Atomic Information, 1749 L St., NW, Washington, D.C.

Many of Camp Detrick's contributions to **safety in the biological laboratory** were on display at the International Congress of Clinical Pathology, which took place 6-10 Sept. in Washington, D.C. The exhibit consisted of vividly presented pictures, slides, and scale models of instruments and techniques developed or

studied by the Army Chemical Corps at Detrick and now available for public use.

The Smithsonian Institution announces the publication of the ninth revised edition of the ***Smithsonian Physical Tables,*** compiled by W. E. Forsythe, physicist (retired) of the General Electric Co. In addition to most of the information included in former editions, the new edition contains sections on atomic and nuclear physics; in other fields, such as cosmic rays, electronics, plastics, aeronautics, and radiation, the material has been greatly amplified. The book may be obtained at cost—$9 for paperbound copies, $10 for clothbound—from the Editorial and Publications Division, Smithsonian Institution, Washington 25, D.C.

Another step has been taken toward the completion of a handbook on numerical values pertaining to biology. A so-called fascicle, **Standard Values in Nutrition and Metabolism,** of the projected Handbook has been prepared under the supervision of the Committee on the Handbook of Biological Data, American Institute of Biological Sciences, Division of Biology and Agriculture, National Research Council. The book, currently distributed as Wright Air Development Center Technical Report 52-301, is issued under the joint sponsorship of the Air Force, Army, Navy, and Atomic Energy Commission, and is a volume of tables of standard quantitative and descriptive data on animal and plant forms. It is intended for use by students and by laboratory and clinical investigators working on biological problems, and will be available in a commercial edition from W. B. Saunders and Co., Philadelphia, in October. The first fascicle, *Standard Values in Blood,* issued 2 yr ago, has already established itself as an indispensable and widely used tool.

Standard Values in Nutrition and Metabolism is the product of the contributions of over 800 specialists in the fields of nutrition and metabolism in this country and abroad. Its 160 tables were subjected to extensive review by experts in the respective subjects. The 223 pages of tables and 16 pages of diagrams contain many thousands of items of authoritative data—mostly quantitative, but with important non-numerical exceptions. J. W. Haim of the Wright Aero Medical Laboratory directed preparation of the work, and Errett C. Albritton of the George Washington University Medical School was editor.

The Federation of American Scientists is continuing its survey of the effects on science of the visa policies in existence under the present United States immigration act [*Science* **119,** 342 (12 Mar. 1954)]. The Federation is interested in information about cases involving **visa difficulties.** It would be helpful if as many details as possible are given, and in each specific case the extent to which material must be treated as confidential should be indicated. Please communicate with the Federation of American Scientists, Committee on Visa Problems, Box 1191, Stanford, Calif.

After an interval of almost 10 yr, publication of the ***Zeitschrift für Kristallographie*** will be resumed. The publishers, Akademische Verlagsgesellschaft, m.b.H., Frankfurt am Main, announce that Vol. 106, No. 2, will be released during October. Professors M. J. Buerger (Massachusetts Institute of Technology), F. Laves (Mineralogisch-petrographisches Institut der Eidg. Techn. Hochschule, Zurich), G. Menzer (Universitätsinstitut für Kristallographie und Mineralogie, München), and I. N. Stranski (Technische Universität, Berlin-Charlottenburg) have agreed to serve as editors of the journal and will exert every effort to perpetuate the tradition of this international periodical founded by Paul von Groth in 1877.

Articles will be printed in German, English, French, and Italian. The October issue will contain original papers by F. Albrecht, G. Borrmann, W. Gerrisch, E. Hellner, F. Laves, G. Menzer, K. Plieth, I. Schönewald, I. N. Stranski, and G. Wolff. The *Zeitschrift* will be published irregularly. One volume will consist of six issues, priced individually. (The price per volume will be approximately $16.65 or about DM 70.00.) Orders and inquiries should be addressed to the publisher at Holbeinstrasse 25–27, Frankfurt am Main, Germany.

Necrology

David P. Barrows, 81, educator, author, and former president of the University of California, Berkeley, Calif., 5 Sept.; **Jean Broadhurst,** 80, research virologist, author, and professor emeritus of bacteriology at Teachers College, Columbia University, New York, N.Y., 5 Sept.; **Harry F. Dietz,** 63, entomologist and manager of the agricultural and chemicals section of the Grasselli Chemicals Dept., E. I. du Pont de Nemours Co., Wilmington, Del., 4 Sept.; **Irwin Edman,** 57, author and chairman of the department of philosophy at Columbia University, New York, N.Y., 4 Sept.; **Henry P. Folland,** 67, pioneer aircraft designer, Nottingham, England, 5 Sept.; **Alfred P. Hart,** 66, pediatrician and pioneer in Rh negative blood transfusions, Toronto, Canada, 4 Sept.; **Glenn S. Hiers,** 58, research chemist for the Collins & Aikman Corp., Philadelphia, Pa., 6 Sept.; **David B. Jones,** 74, author and retired head of the protein investigation laboratories of the bureau of human nutrition and home economics, U.S. Dept. of Agriculture, Beltsville, Md., 5 Sept.; **Martin C. Madsen,** 61, chief engineer for the Northern Natural Gas Co., Omaha, Nebr., 4 Sept.; **Robert J. Minshall,** 56, principal designer of the B-17 airplane and former director of research for the Pesco Products Div. of the Borg-Warner Corp., Cleveland, Ohio, 7 Sept.; **Cyril F. Richards,** 59, former professor of philosophy and psychology and vice president of Denison University, Granville, Ohio, 7 Sept.; **Roger H. Sherman,** 51, authority on oil exploration and coordinator of all oil-producing activities of the Standard Oil Co., New York, N.Y., 5 Sept.; **Robert M. Stewart,** 76, retired Dominion Astronomer of the Dominion Observatory, Ottawa, Canada, 2 Sept.

Book Reviews

Airplane Structures. vol. I. Alfred S. Niles and Joseph S. Newell. Wiley, New York, and Chapman & Hall, London, ed. 4, 1954. xv + 607 pp. Illus. $7.75.

In most fields of engineering education there are usually one or more textbooks that continue to live as the decades roll by and countless young men and women are trained and educated to enter the many phases of the engineering profession. *Airplane Structures,* representing the aeronautical structural field, is such a textbook. For more than 30 years it has continued to serve as a recognized and widely used textbook as well as a reliable reference for the practicing engineer.

The fourth edition of *Airplane Structures,* although maintaining practically the same chapter outline as the third edition, is far more than the usual revised edition, since nearly every chapter has been completely rewritten and in several cases greatly modified or expanded. The preface of this edition indicates that most of the revision was completed before Newell's death in 1952, and thus I sincerely feel that this excellent edition is a final fitting tribute to an individual who has done so much to assist countless persons to prepare for and to build careers in aeronautical engineering.

A study of the new edition indicates a number of important additions and changes. They are as follows.

1) A completely new chapter concerned with basic information on the properties of materials as needed or necessary for structural analysis and design of aeronautical structures. The normal curriculum in aeronautical engineering is usually too crowded to permit a separate course on materials, hence the instructor must cover this subject in his regular beginning structures course. This new chapter on materials should therefore prove a welcome and useful addition.

2) The conventional airplane structure involves a single or multiple thin-walled cellular tube with both longitudinal and transverse stiffening elements. The efficient strength and rigidity design of this type of structure requires a thorough understanding of basic simple bending theory, particularly the so-called "shear flow distribution." The fourth edition contains a greatly expanded presentation on this subject and should prove quite welcome to teachers, since the treatment of this subject in the third edition was somewhat limited.

3) This edition deserves considerable praise for its extensive lists of new home problems at the end of most chapters. These excellent problem lists have been made more useful to the instructor and the student by arrangement into four groups, with each group presenting problems to emphasize a different goal in the training of the student.

4) The conventional airplane involves a multitude of various types of connections and fittings, the analysis and design of which are just as important as the primary structure. This book presents much new material on connections, particularly on riveted joint analysis.

Included as the last chapter is an introduction to statically indeterminate structures, a subject that was presented in volume II of the third edition. Since much other material formerly presented in volume II of the third edition has been transferred to volume I of the fourth edition, such as the treatment of the semitension field beam, I wonder why a chapter on the analysis of closed rings or frames was not included in this edition, for such structural units are a very important part of modern aircraft structures.

Both teachers and practicing engineers should welcome and make considerable use of the comprehensive reference lists at the end of each chapter.

As during the past 30 years, *Airplane Structures* will continue to play a very important part in the education of aeronautical engineers.

E. F. Bruhn
School of Aeronautics, Purdue University

Symbolic Wounds. Puberty rites and the envious male. Bruno Bettelheim. Free Press, Glencoe, Ill., 1954. 286 pp. $4.75.

Bruno Bettelheim's stimulating and controversial book has two aims. On the positive side, it seeks to propose a new theory of puberty rites on the basis of clinical and anthropologic data indicating that men's envy of the female organs and of their functions is at least as strong as, if not stronger than, women's envy of the male organ.

In support of this thesis, Bettelheim cites a variety of cogent facts, such as the ritual surgery of the Australian aborigines which seeks to make the subincised penis like a vulva and which enables the male to equate the bleeding of his mutilated penis with the menses. He also cites data showing that men go through various rites suggesting that they too are capable of bearing children and of duplicating other important female sexual functions. These attempts often constitute the essence of "male secrets" whose spuriousness must not be revealed to the women. Due emphasis is also placed on Nunberg's finding that circumcised men, be they Occidental neurotics or normal primitives, often fantasy that circumcision was initiated by women and has as its aim the enhancing of women's sexual pleasure. The author's numerous clinical and anthropologic data appear to substantiate the validity of his qualitative, although not necessarily his quantitative, thesis; that is, whereas male envy of female procreative functions may be held to have been proved, I am not convinced that this envy has been shown to be *stronger* than female penis envy.

The book's second, negative or critical purpose is to challenge Freud's theory that circumcision represents attenuated castration and has as one of its chief pur-

poses the sexual and other intimidation of the young male by the old male, and the enforcement of the incest taboo. Actually, because of the basic fact that all psychic activities are heavily overdetermined, a proof of the validity of Bettelheim's thesis does not *automatically* represent a refutation of Freud's thesis and must, instead, be viewed as a valuable supplementation thereof. Bettelheim's attempted "refutation" of Freud's view also suffers from factual inaccuracies. He asserts that circumcision is nowhere equated with castration. Yet, in Merker's book on the Masai, which Bettelheim cites, we read that an initiate's father was ridiculed by the circumcisers, because during circumcision the son allegedly "bellowed like a bull which is being castrated." The statement that male Australian aborigines are kind fathers is correct but does not abolish the fact that among those people, in times of famine, foetuses are aborted to feed those already born, small children are fed to older ones, the young are terrorized by the magic "bone pointing" of old men, and the penalty for a trespass on the dietary and other privileges of the old is the indefinite postponement of the signs of sexual maturity—surely an equivalent of castration-threats.

On the whole, Bettleheim rendered an important service to anthropology and psychoanalysis alike by his thoughtful and creative discussion of a relatively neglected and highly important aspect of the relationship between the sexes and of puberty rites, which supplements but in no way refutes other psychoanalytic and anthropologic theories regarding these complex matters.

The publishers are to be congratulated for having published a fine book in a format worthy of its contents.

GEORGE DEVEREUX

Devereux Foundation, Devon, Pennsylvania

Fluid Dynamics. vol. IV. Proceedings of 4th symposium in applied mathematics of the American Mathematical Society held 22–23 June 1951. M. H. Martin, Ed. McGraw-Hill, New York, 1953. v + 186 pp. Illus. $7.

This book, the fourth volume in the valuable series of reports on applied mathematics symposiums arranged by the American Mathematical Society, contains 12 papers written by specialists for specialists. Some of the authors are leading authorities in their fields, and all papers are written on a very high level of competence. There are three points of view discernible in the literature of fluid dynamics: that of the physicist, that of the aeronautical engineer, and that of a professional mathematician. All three are ably represented in this collection.

Some of the papers are comprehensive reviews of the subject. Others are technical discussions of a single problem that could just as well have been published in a scientific journal. As far as subject matter goes, some papers deal with recently developed disciplines of fluid dynamics, which abounds in open problems and even in controversies, such as the theory of turbulence and the theory of potential transonic flows. Other papers discuss such classical matters as conformal mapping and the solution of the Poisson equation, the emphasis in this case being on effective numerical solutions. The fact that new and interesting results are possible in such fields confirms the dictum of Poincaré that no mathematical problem is ever completely solved.

There are two papers on turbulence (Chandrasekhar, Lin), six papers on flows of compressible fluids (Busemann, Meyer, Thomas, Carrier and Yen, Martin and Thickstun, Burgers), five papers on incompressible flows (Heins, Theodorsen, Birkhoff, and Young and Zarantonello, Synge, Weinstein), and one paper on hydrodynamics and thermodynamics (DeGroot). The book is very attractively printed. There are voluminous bibliographies and a good index.

Although no book of 186 pages can possibly give a comprehensive picture of the present state of fluid dynamics, this volume gives an excellent cross section of this actively developing science, and it will be of great value to every worker in this field.

LIPMAN BERS

Institute of Mathematical Sciences, New York University

Intertidal Invertebrates of the Central California Coast. S. F. Light's *Laboratory and Field Text in Invertebrate Zoology*, rev. by Ralph I. Smith *et al.* Univ. of California Press, Berkeley, 1954. xiv + 446 pp. Illus. $5.

The book under review is a new revision of the late S. F. Light's well-known laboratory and field textbook for his course at the University of California. The significance of the book is greater than its primary purpose as a guide to the identification of the fauna of a limited region for the use of a particular university course, and it is this significance that invites wide notice. What we have is a series of illustrated determinative keys to the species of the more common intertidal animals. Each key is preceded by a compact discussion of the group, emphasizing the morphology that must be mastered before attempting identifications, and each is followed by a list of species, sometimes annotated, which will find wide use faunistically.

The revision has been made mostly by specialists with a firsthand knowledge of the groups, and the work therefore makes a distinct contribution to the knowledge of the California marine fauna. There are additional sections on problems of classification and identification and a rather extended chapter on field studies that is arranged on a habitat basis. Specific suggestions are made for special problems that can profitably be investigated during a summer course. There is a highly selected, useful bibliography. The book is not meant as a self-sufficient textbook of general invertebrate zoology; the discussions of morphology, classification, and ecology are not that complete.

The book is very successful in meeting its particular aim, but its practical usefulness will decrease with distance from central California. Some of the features are obviously designed to fit the particular University course for which it was written, and these will probably find varying usefulness elsewhere. The term *intertidal* is broadly construed, for we find some material on fresh-water and even terrestrial forms; the term *invertebrates* is treated equally liberally, for there are keys to common marine algae and intertidal fishes. Nevertheless, the emphasis matches the title, and the supplementary material is justified.

It seems almost impossible to assemble an extensive group of keys without having some of the couplets involve undefined terms and unspecific comparisons. The difference between *short, stout,* and *slender* is always quite obvious to the constructor of a key but is likely to worry even an experienced zoologist until he becomes familiar with the group. In the present case, there seem to be relatively few uncertainties that cannot be resolved by reference to figures. This condition is not surprising, for the original version was used for many years.

W. T. EDMONDSON
Department of Zoology, University of Washington

Adaptation in Micro-organisms. Third Symposium of the Society for General Microbiology, London, April 1953. R. Davies and E. F. Gale, Eds. Cambridge Univ. Press, New York, 1953. 339 pp. Illus. + plates. $6.

This book records the papers and some of the discussion presented at the third symposium of the Society for General Microbiology held in London in April 1953. The quality of the contributions is rather uneven, as might be expected; some papers are valuable and important summaries of the work of major contributors to this branch of biology, whereas other papers are mediocre or even misleading.

An introductory chapter by Stanier is an attempt to limit debate by carefully defining the fields to be discussed. Unfortunately the effort was in vain, for the next paper by Dean and Hinshelwood is a clear-cut example of the anarchy that results from the refusal to accept any restrictive definitions. It is obvious also that these authors refuse to accept any experimental results that conflict with their own preconceptions of the mechanisms of adaptation. An enlightening comment by Hinshelwood in discussion (p. 42) is

> Strictly speaking, it is begging the question to include in this argument those cases [such as the lactose variants] where it is still *sub judice* whether the change was or was not a mutation. If and when such cases are examples of mutations, these are of course positive ones.

It is precisely the case of the lactose variants of *E. coli* in which the interplay of genetic control and phenotypic expression has been most clearly demonstrated.

Then follows a series of remarkably clear and well-written papers: on adaptation to the utilization of various substrates in the citric acid cycle by Ravin; on the adaptive synthesis of cytochrome oxidase by Slonimski; on the nature of the precursors in the induced synthesis of enzymes by Spiegelman and Halvorson; on a hypothesis concerning the specific control of the synthesis of adaptive and constitutive enzymes by Cohn and Monod; on a cyclic mechanism of adaptive enzyme formation to explain the kinetics of penicillinase synthesis by Pollock; and on the important role played by temperature in enzymic adaptation by R. Knox.

The discussion of the development of drug resistance in microorganisms by Abraham is strongly biased toward the Hinshelwood school, although a deceptive air of impartiality is attempted. The discussions of drug resistance in staphylococci by Barber and in mycobacteria by Mitchison are primarily descriptive and avoid controversial aspects. The paper by Hewitt on the influence of bacteriophage on bacterial variation and evolution presents a remarkably confused and distorted picture of this important field. It is unfortunate that this is the only paper in this symposium that deals with the effects of bacteriophages on the properties of bacterial cultures. The remaining three papers deal with adaptations in paramecia by Beale, adaptations in thermophiles by Clegg and Jacobs, and adaptations in fungi by Brown and Wood. This book makes very interesting reading, but the reader must be alert to distinguish fact from fancy.

MARK H. ADAMS
Department of Microbiology,
New York University College of Medicine

Introduction to the Chemistry of Enzymes. Keith J. Laidler. McGraw-Hill, New York–London, 1954. ix + 208 pp. Illus. $5.

According to the publishers, this book was "written particularly for biochemistry students . . . at the undergraduate level." They further state that "The author has kept in close focus the needs of the biologist desiring adequate knowledge of the chemical aspects of his subject and those of the physical chemist who wants to learn something of enzymes. . . ."

The first chapter deals with the general characteristics of enzymes, including their role as catalysts, their specificity, classification, and an explanation of prosthetic groups. The second chapter is concerned with the kinetics of enzyme reactions. The topics covered in this chapter include a brief explanation of the order of enzyme reactions and the influence of pH, substrate concentration, inhibitors, and temperature. The derivations of the Michaelis-Menten equation under normal conditions and in the presence of inhibitors are well covered in the classic manner. The use of the Arrhenius equation is presented at the proper level.

Chapters 3–7 discuss individual enzyme systems with special reference to the proteolytic enzymes, particularly the specificity of the peptide bonds hydrolyzed; the remaining hydrolytic enzymes and the

phosphorylases, with brief examples of the members in the various classes; the oxidative enzymes; and the splitting, transferring, and isomerizing enzymes.

The last two chapters, in which the author discusses the inactivation of enzymes and the mechanism of enzyme action, are by far the best in the book. In these chapters, the author introduces the student to many concepts that are not found in the average college textbook.

The main criticism that I offer concerns the lack of adequate references, especially in the first seven chapters. It is my opinion that this introductory textbook will serve the purposes for which it was intended.

HOWARD B. BENSUSAN

Department of Physiology,
University of Maryland School of Medicine

The Dynamics of Virus and Rickettsial Infections. International symposium sponsored by the Henry Ford Hospital, 21–23 Oct. 1953. Frank W. Hartman, Frank L. Horsfall, Jr., and John G. Kidd, Eds. Blakiston, New York, 1954. xii + 461 pp. Illus. $7.50.

A résumé of this symposium written by one of the editors of the book recently appeared [*Science* 119, 427 (1954)]. Since it provides an excellent summary of the content of the symposium and, thereby, an outline of the present volume, this review is critical rather than abstractive. Taken individually, the majority of the articles are timely and thought provoking; several are detailed research reports and several are general reviews. Most, however, attempt to reveal or to stimulate inquisitiveness into the basic dynamics of viral and rickettsial action and host relationships; the greater proportion of these succeed in this attempt.

The editors have allowed drastic revision by the participants. This is lamentable. A few of the authors, in the obsequious interest of a stereotyped scientific report, have removed the spice that added savor to their original presentation. One paper in particular has little, if any, resemblance to the original. Many references to earlier papers made by later participants and discussants are therefore without precedent.

In the main, the illustrations are well chosen and presented. The book would have had a more polished appearance if several charts of the quill-pen variety had been redrawn.

This book, because of a timely topic presented by a select group of participants, should be both stimulating and informative to the virus worker. The provocative viewpoints of these authorities, no doubt, will establish the trend for basic viral research for some time. Had these papers and the discussions been organized more coherently, this book could have been recommended to readers other than those actively engaged in research in this field.

MERRILL J. SNYDER

Section of Infectious Diseases,
Department of Medicine,
University of Maryland School of Medicine

A First Course in Ordinary Differential Equations. Rudolph E. Langer. Wiley, New York; Chapman & Hall, London, 1954. 249 pp. Illus. $4.50.

This is a teachable and eminently sound textbook for a beginning course, written by a recognized authority on the subject. The author has included an astonishing range of topics in a very few pages and has achieved the happy combination of mathematical clarity with physical applications. Each item is treated with the utmost brevity compatible with precision. Abundant problems are supplied. Besides what may be called the usual material included in a beginning course, there are sections on the Riccati equation, Legendre, Bessel, gamma, and hypergeometric functions, and Laplace transform. These sections should be valuable and stimulating introductions to further study. Other features that may be mentioned are greater emphasis on exact equations, systematic use of first integrals, and reduction of the solution of the second-order linear equation with constant coefficients to the solution of a Riccati equation.

Here is a first-class addition to the postwar spate of differential-equations textbooks.

M. E. SHANKS

Departments of Mathematics
and *Aeronautical Engineering, Purdue University*

Introduction to Nuclear Engineering. Richard Stephenson. McGraw-Hill, New York–London, 1954. xii + 387 pp. Illus. $8.

Richard Stephenson has produced a volume that admirably fills a very important gap in the field of engineering textbooks. As stated in the preface,

> . . . although the original development of nuclear energy was carried out almost entirely by theoretical scientists, now that the fundamental principles have been established, the further use of nuclear energy is falling more and more into the province of the engineer. If the engineering profession is to accept the responsibilities created by this new scientific field, the younger engineers must be willing to undertake such problems as radiation shielding, radiation damage, chemical processing of radioisotopes, and the engineering design of nuclear chain reactors.

The author has succeeded in writing a textbook that provides a solid basis for any engineering student, in his senior or graduate years, to acquire the rudiments of the underlying technology in this field. He has written from an engineer's viewpoint, supplying many illustrative worked-out examples in the text and a large selection of problems at the end of each chapter.

For those readers unfamiliar with the properties of neutrons and their interactions with matter, the first four introductory chapters are provided. The last of these is a fairly complete account of reactor theory, which is probably the part of the book that would be expected to be the most difficult for the average engineering student. However, adequate references to the more extensive discussion in the recent book by Glass-

tone and Edlund [*The Elements of Nuclear Reactor Theory* (Van Nostrand, New York, 1952)] are provided.

The chapter on radiation shielding is the best discussion of this field, exclusive of classified material, that I have seen. Additional chapters on materials of construction, reactor instrumentation, isotope separation, chemical processing, and special techniques in nuclear engineering complete a very valuable book.

The style of writing is clear and concise, and excellent judgment has been displayed in the level of maturity at which the mathematical proofs are presented. A working knowledge of first-year calculus is all that is required. Boundary value problems are adequately discussed without worrying the student with respect to the vast extent of the subject.

This book will be welcomed by the increasing number of university staffs who recognize the need for including instruction in the nuclear field for all students of modern engineering.

DONALD H. LOUGHRIDGE
The Technological Institute, Northwestern University

New Books

The Kidney. A Ciba Foundation Symposium arranged jointly with the Renal Association. A. A. G. Lewis and G. E. W. Wolstenholme, Eds. Little, Brown, Boston, 1954. xvi + 333 pp. Illus. + plates. $6.

Substances Naturelles de Synthèse. vol. IX. Préparations et méthodes de laboratoire. Leon Velluz, Ed. Masson, Paris, 1954. 186 pp. Illus.

Discover the Stars. Gaylord Johnson; revised by Irving Adler. Sentinel Books, New York, rev. ed., 1954. 130 pp. Illus. Paper, $0.75.

Protein Metabolism. R. B. Fisher. Methuen, London; Wiley, New York, 1954. ix + 198 pp. Illus. $2.50.

Shock and Circulatory Homeostasis. Trans. of the Third Conference, 14–16 Sept. 1953. Harold D. Green, Ed. Josiah Macy, Jr. Foundation, New York, 1954. 230 pp. Illus. $3.50.

Sex in Microorganisms. A symposium presented on 30 Dec. 1951 at Philadelphia meeting of AAAS. D. H. Wenrich, Ivey F. Lewis, and John R. Raper, Eds. AAAS, Washington, D.C., 1954. v + 362 pp. Illus. $5.75 (Members, $5.).

A Laboratory Program for General Chemistry. J. R. Morton, D. R. Clippinger, and L. P. Eblin. Houghton Mifflin, Boston, 1954. vi + 272 pp. Illus. Paper, $2.50.

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Technical Papers

Metabolic Oxidation of Phenobarbital to *p*-Hydroxyphenobarbital

Thomas C. Butler

Department of Pharmacology, University of North Carolina School of Medicine, Chapel Hill

Numerous aromatic compounds have been found to undergo oxidation to phenolic products in the mammalian organism. This type of reaction might be expected to occur in the phenyl group of phenobarbital (5-ethyl-5-phenyl barbituric acid), but it has not hitherto been described. This report (*1*) concerns the discovery in dog urine of a product of the metabolism of phenobarbital and its identification as the *p*-hydroxy derivative of phenobarbital.

The compound as present in urine is largely conjugated and can be released by acid hydrolysis. An equal volume of concentrated hydrochloric acid is added to urine, and the mixture is refluxed for 3 hr. Phenobarbital and *p*-hydroxyphenobarbital are stable under these conditions. Both compounds are extracted from the acid urine with ether, and their separation and purification are accomplished by a systematic procedure of partitions between ether and buffers and benzene and buffers and finally by crystallization from water. The physical properties on which the isolation procedures are based are shown in Table 1. From urine collected for 3 wk from a dog receiving daily doses of phenobarbital, there were isolated in this way 1.54 g of *p*-hydroxyphenobarbital and 0.29 g of unchanged phenobarbital.

The structural identification of the urinary product was established by synthesis. The synthesis of *p*-hydroxyphenobarbital, which has not previously been described, was carried out by the following procedure. *p*-Nitrophenobarbital was prepared by the method of Pierce and Rising (*2*), and the position of the nitro group was confirmed by their procedure of hydrolysis and oxidation to *p*-nitrobenzoic acid. *p*-Nitrophenobarbital was converted to the phenolic derivative by catalytic reduction with hydrogen, diazotization of the amine, and hydrolysis of the diazonium salt. *p*-Hydroxyphenobarbital crystallizes from water with 1 mole of water. It melts at 222° to 223°C, corrected. The ultraviolet absorption spectrum as it is influenced by *p*H is indicative of three dissociations, corresponding to the loss of the protons from the two nitrogen atoms and the phenolic group. Identity of the urinary product with the synthetic compound was demonstrated by the method of mixed melting points. Analysis of hydrate (urinary origin): C, 54.01, 54.20; H, 5.09, 4.95; N, 10.42, 10.52 percent. Calculated for $C_{12}H_{14}O_5N_2$: C, 54.12; H, 5.30; N, 10.52 percent.

Table 1. Physical properties of phenobarbital and *p*-hydroxyphenobarbital furnishing the basis for the isolation procedures.

Compound	Partition coefficient of acid form		pK_1'*
	Ether/water	Benzene/water	
Phenobarbital	60	1	7.23
p-Hydroxyphenobarbital	5	0	7.30

* At 38°C and total ionic strength of 0.1.

The other isomeric hydroxyphenobarbitals have not yet been found in urine, but a search for traces of these compounds continues. The conjugated form or forms in which *p*-hydroxyphenobarbital is excreted are still unidentified. Conjugation might be expected to occur with both glucuronic acid and sulfuric acid.

In doses as high as 1 g/kg, *p*-hydroxyphenobarbital is not anesthetic in mice. It appears that oxidation of phenobarbital to the phenolic derivative is a mechanism of major importance in the pharmacologic inactivation of the drug.

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1. This investigation was supported in part by a research grant (B-384) from the National Institute of Neurological Diseases and Blindness, National Institutes of Health, U.S. Public Health Service.
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13 May 1954.

Determination of Isotopic Carbon in Organic Compounds

K. E. Wilzbach and W. Y. Sykes

Chemistry Division, Argonne National Laboratory, Lemont, Illinois

The determination of isotopic carbon in organic compounds has been simplified by development of a procedure in which the sample is heated with copper oxide in a sealed tube and the carbon dioxide produced is isolated by fractional condensation in vacuum. The method is applicable to a wide variety of compounds and yields results that are reproducible to 1 percent and agree with values obtained by a more elaborate procedure (*1*) based on Pregl combustion. Operations required to obtain a sample of gas for isotopic analysis can be performed in 30 min without elaborate equipment. The similarity of the procedure to the zinc fusion technique (*2*) for tritium assay renders it particularly attractive where research with tritium, as well as with C^{14}, is anticipated.

A convenient system for application of this procedure to the determination of C^{14} is shown in Fig. 1. In combustion tube *A*, made from a 17-cm length of 11-mm OD Pyrex 1720 glass tubing (*3*) by drawing out one end to form a break tip, are placed 0.75 g of

60-mesh copper oxide and 0.25 g of 60-mesh reduced copper. A weighed sample, 1 to 10 mg, of the organic compound, in either a sealed ampoule or a porcelain boat, is added, and the tube is constricted, evacuated, and sealed. The tube is then agitated to break any ampoule present and to mix the contents. Afterward it is heated (*4*) in a horizontal position for 30 min at (640 ± 10)°C.

After being cooled, the tube is placed in a larger tube *B*, which is subsequently evacuated, closed off, and inverted to break the tip of the combustion tube. The combustion products are then condensed at −195°C in the first tube, *D*, of a series of U-tubes. In a single distillation, carried out by removing the cooling bath, water and less volatile combustion products are condensed at −95°C (*5*) in the second tube, *E*, and carbon dioxide is condensed at −195°C in the third tube, *F*. The carbon dioxide is expanded from tube *F* into the constant-volume manometer *M* and measured manometrically if a value for the carbon content of the sample is desired. For determination of radioactivity, the carbon dioxide is expanded from tube *F* into an evacuated ionization chamber *C* and diluted to atmospheric pressure with tank carbon dioxide; the transfer of radioactive gas can be made quantitative if the tank carbon dioxide is added through inlet *G* and tube *F*. The ionization current is measured, as in tritium assay (*6*), with a vibrating reed electrometer (*7*).

The use of the water condensed in tube *E* for assay of isotopic hydrogen is not satisfactory, since there is appreciable retention of sample hydrogen in the combustion tube. It is interesting to note, however, that tritium analyses by the zinc fusion technique can be performed in this system if the ionization chamber is mounted on tube *D*.

Analyses of organic compounds for C^{14} by ion current measurements on carbon dioxide (Table 1) show that values obtained via sealed-tube combustion are 100.60 ± 1.1 percent of those obtained (*1*) via Pregl combustion. The standard error of an analysis is 0.46 percent in sealed-tube combustion and 0.64 percent in Pregl combustion. The applicability and reliability of sealed-tube combustion are further indicated by the results (Table 2) of total carbon, obtained by manometric measurement of carbon dioxide, in a variety of compounds; the observed values are 100.67 ± 0.30 percent of those calculated. The correspondence of these results to theoretical values suggests the possible development of the procedure into a satisfactory analytic method for total carbon.

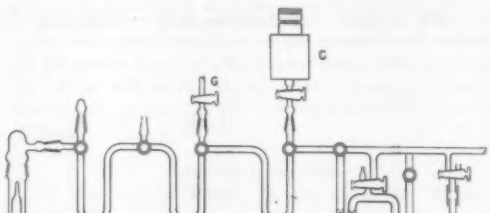

Fig. 1. Apparatus for analysis of carbon dioxide from sealed-tube combustions.

Table 1. Determination of radioactive carbon.

Compound	Carbon-14 (μc/g)	
	Pregl combustion	Sealed-tube combustion
Sucrose*	224.0	224.7
	223.1	224.8
Dextran*	5.66	5.65
	5.70	5.67
Methyl trityl ether	54.16	54.87
	54.73	55.59
		55.74
Tetramethylglucose	0.791	0.782
	.776	.776
	.775	
Pentothal†	2748	2774
	2750	2781
Ethylenediaminetetraacetic acid†	7805	7970
	7812	7897

* Supplied by N. J. Scully of Argonne National Laboratory.
† Supplied by Abbott Laboratories, North Chicago, Ill.

Table 2. Determination of total carbon.

Compound*	No. of analyses	Carbon (%)	
		Calc.	Found
Acetanilide	1	71.09	71.26
Acetoacetanilide	2	67.78	68.44
Acetophenone	4	79.97	81.02
Anthracene	2	94.34	94.88
Benzene	2	92.25	92.67
Benzoic acid	2	68.84	69.34
Biphenyl	2	93.46	94.38
Bromobenzene	2	45.89	45.92
n-Butyl alcohol	2	64.81	65.58
n-Butyl bromide	1	35.06	35.19
n-Butyl chloride	1	51.90	52.30
n-Butyl iodide	1	26.10	26.69
Chlorobenzene	2	64.02	64.74
Cholesterol	2	83.87	84.05
Cholesterol acetate	2	81.25	81.33
Desoxycholic acid	2	73.43	73.90
Di-*p*-tolyl sulfone	1	68.26	68.73
Hexane	2	83.63	84.08
8-Hydroxyquinoline	1	74.47	74.10
Iodobenzene	2	35.32	35.72
Methyl isobutyl ketone	1	71.95	72.03
o-Nitrobenzoic acid	2	50.30	50.47
n-Octadecane	3	84.95	85.66
n-Propyl alcohol	4	59.96	60.71
p-Toluenesulfonamide	2	63.13	63.38

* Shelf samples of Matheson Co. chemicals were used in most cases.

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3. Tubing of Pyrex 1720 glass is available on special order from Corning Glass Works, Corning, N.Y. Quartz or Vycor tubing is also satisfactory.
4. A furnace, series 9ADL of the K. H. Huppert Co., Chicago, can be used, with a quartz liner, to heat eight tubes in one loading.
5. This temperature is obtained with a melt, formed by addition of liquid nitrogen, of toluene or di-*n*-butyl ether.
6. K. E. Wilzbach, A. R. Van Dyken, and L. Kaplan, *Anal. Chem.* **26**, 880 (1954).
7. Calibration with standard samples has established that the charge collected at 450 v in a Borkowski-type chamber filled to atmospheric pressure with carbon dioxide corresponds to 1.39×10^{-16} coulomb per disintegration of C^{14}.

8 July 1954.

Enhancement of Biological Activities of Corticosteroids by Substitution of Halogen Atoms in 9α Position

Grant W. Liddle, Maurice M. Pechet, Frederic C. Bartter

Section on Clinical Endocrinology, Clinic of General Medicine and Experimental Therapeutics, National Heart Institute, Bethesda, Maryland

The biological actions of hydrocortisone are readily distinguishable from those of desoxycorticosterone. Thus, while hydrocortisone has comparatively little sodium-retaining activity, it has until recently been the most potent known steroid in carbohydrate metabolism, in anti-inflammatory activity, and in depressing the number of circulating eosinophils. Desoxycorticosterone, on the other hand, while practically devoid of carbohydrate effects, anti-inflammatory activity, and eosinopenic activity, has until recently been the most potent known steroid in sodium-retaining activity. It has been of interest to us, therefore, that hydrocortisone, when it bears a fluorine or chlorine atom in 9α position, not only becomes more potent than hydrocortisone itself in carbohydrate and eosinopenic activity but also becomes more potent than desoxycorticosterone in sodium-retaining activity.

Fried and Sabo (*1, 2*) and Borman and Singer (*3*) have reported that substitution of either a fluorine or a chlorine atom in the 9α position of either cortisone or hydrocortisone results in enhancement of the activity of these corticosteroids as measured by glycogen deposition in the livers of fasting adrenalectomized rats.

We have studied, in adrenalectomized dogs, the comparative pharmacology of 9α-chlorocortisone acetate (chloro E Ac), 9α-chlorohydrocortisone acetate (chloro F Ac), 9α-fluorohydrocortisone acetate (fluoro F Ac), 9α-bromohydrocortisone acetate (bromo F Ac), cortisone (E), hydrocortisone (F), hydrocortisone acetate (F Ac), desoxycorticosterone (DOC), and desoxycorticosterone acetate (DOCA) (see Table 1). Several of these steroids have been studied, under a metabolic regimen, in patients with Addison's disease (*4*).

Effects on excretion of sodium and potassium. In adrenalectomized dogs, E and F, given intravenously in doses of 2 mg or less, had no appreciable effect on excretion of either sodium or potassium during the 4-hr period following administration. When given in doses of 4 to 20 mg, these steroids induced increases in excretion of both sodium and potassium during the ensuing 4 hr. In no dosage did E or F cause sodium retention. Chloro E Ac, chloro F Ac, and fluoro F Ac, on the other hand, resembled DOC in that each of these steroids in doses of 25 to 100 μg induced sodium retention and potassium loss. The magnitude of these responses was a direct function of dosage. Assays of these activities in adrenalectomized dogs indicated that chloro F Ac had 3.3 (1.9–5.2) (95 percent confidence limits) times the potency of equimolar doses of DOC, while chloro E Ac had 2.1 (1.2–3.8) and fluoro F Ac had 4.7 (2.4–9.2) times the potency of DOC. It was apparent that, insofar as these halogenated steroids caused acute sodium retention in adrenalectomized dogs, they differed qualitatively, as well as quantitatively, from their nonhalogenated analogs.

Effects on glomerular filtration rate. DOC apparently exerted its acute effects on electrolyte excretion by acting on renal tubular transport, since it failed to bring about any consistent changes in glomerular filtration rate (GFR) in doses up to 8 mg. Compounds

Table 1. Relative potencies of various steroids during 4-hr periods following intravenous administration to adrenalectomized dogs.

Steroid	Dose (μg)	Eosinopenia	GFR increase	Sodium retention	Potassium loss
Cortisone or Hydrocortisone Ac	100–2000	0	0	0	0
	4000–8000	+	+	− (Loss)	+
9α-Chlorocortisone Ac or 9α-Chlorohydrocortisone Ac	25–200	0	0	+	+
	500–4000	+	+	+ or −	+
9α-Fluoro-hydrocortisone Ac	25–100	0	0	+	+
	200–800	+	+	+ or −	+
9α-Bromo-hydrocortisone Ac	25–100			0	0
	100–400			0	+
Desoxycorticosterone	50–8000	0	0	+	+

E and F, in doses of 4 mg or more, and their halogenated derivatives, in doses of 0.5 mg or more, regularly induced increases in the GFR of adrenalectomized dogs; this effect became apparent during the second hour after administration of the steroids and was sustained througout the remaining collection periods. The sodium loss that occurred following administration of E and F during renal clearance studies was invariably associated with an increase in GFR. Whereas the halogenated steroids administered in small doses (which did not increase GFR) regularly caused acute retention of sodium, these same steroids administered in larger doses (which did increase GFR) frequently induced sodium loss. This paradox can be resolved by the assumption that all these steroids increase tubular reabsorption of sodium. This enhancement of sodium reabsorption, however, may be insufficient to result in a net conservation of sodium if the filtered load of sodium that is presented to the tubules is simultaneously increased.

Effects on circulating eosinophils. In adrenalectomized dogs, the decrease in circulating eosinophils was determined 4 hr following the intravenous administration of graded doses of various steroids, as a simple index of their "glucocorticoid" activity. When compared on an equimolar basis, fluoro F Ac was 20 (11–36) and chloro F Ac was 8 (5–13) times as active as F Ac.

Effects in Addison's disease. Studies carried out in two patients with Addison's disease indicated that the fluoro- and chloro-derivatives of F were considerably more effective in the treatment of this disease than were equimolar quantities of either F itself or DOC. In the longer term clinical studies, the enhanced potency of the halogenated steroids appeared to be even greater than that which was anticipated on the basis of the acute assays in animals. The symptoms of Addisonian crisis (nausea, vomiting, asthenia, and so forth) were corrected within 4 hr of the oral administration of either 0.5 mg of fluoro F Ac or 1.5 mg of chloro F Ac. Repetition of these doses every 4 hr resulted in progressive improvement in feelings of well-being, depression of circulating eosinophils, marked retention of sodium, and transient increases in potassium excretion. Withdrawal of the steroids was followed by a reversal of these effects.

Substitution of bromine. Bromo F Ac in doses of 25 to 100 μg had no effect on the excretion of sodium or potassium in adrenalectomized dogs, while in doses of 100 to 400 μg it induced some increase in the excretion of potassium but no consistent retention of sodium.

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4. We wish to thank Joseph Fried of the Squibb Institute for Medical Research, Elmer Alpert of Merck and Co., and Robert Gaunt of Ciba Pharmaceutical Co. for generous supplies of the steroids employed in this study.

1 June 1954.

Serum Glutamic Oxaloacetic Transaminase Activity in Human Acute Transmural Myocardial Infarction

John S. LaDue, Felix Wróblewski, Arthur Karmen

Sloan-Kettering Institute and Department of Medicine, Memorial Center, New York

Glutamic oxaloacetic transaminase is widely distributed in animal tissues but is most concentrated in heart muscle (*1, 2*). This property led us to study its concentration in human serum following acute myocardial infarction.

The presence of this enzyme in human blood serum and whole blood hemolysates was previously demonstrated in our laboratory (*3*) using quantitative paper chromatographic analysis of the glutamate present after incubation of serum with aspartate and α-ketoglutarate. The chemical characteristics of the enzyme in serum were studied and found to be similar to those reported for animal tissues. The normal range of activity in human serums and hemolysates was established. The level was found to be elevated in certain disease states but notably so in two patients with acute transmural myocardial infarction.

These studies led to the development of a relatively rapid spectrophotometric assay of serum glutamic oxaloacetic transaminase activity and permitted the extension of our observations.

Transaminase activity is measured by adding serum to a substrate containing aspartate and α-ketoglutarate, which in the presence of malic dehydrogenare oxidizes DPNH to DPN. The resulting change in optical

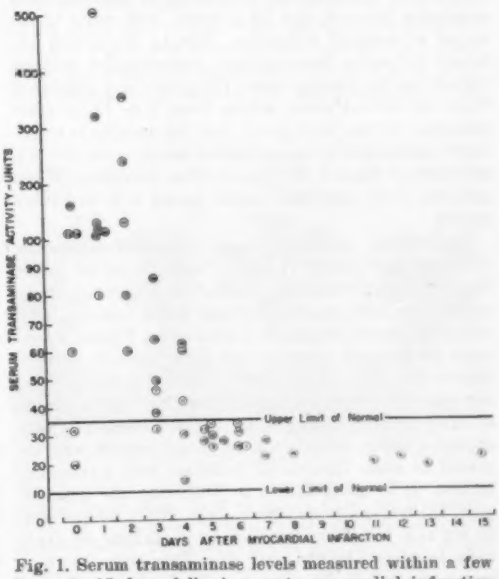

Fig. 1. Serum transaminase levels measured within a few hours to 15 days following acute myocardial infarction in 16 patients.

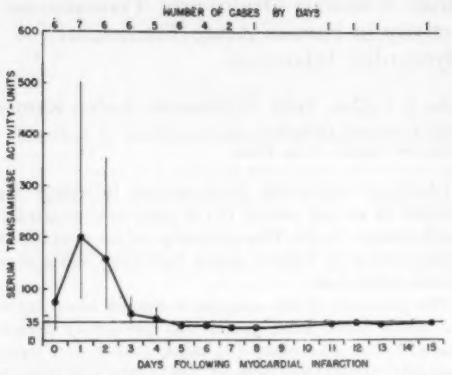

Fig. 2. Average level of serum transaminase on various days following acute myocardial infarction. The extremes of the vertical lines represent the highest and lowest values from which the averages were calculated.

density of the solution is measured in a Beckman spectrophotometer (*3*). The unit of activity was defined as the amount present in 1.0 ml of serum that causes an optical density decrease of 0.001 at wavelength 340 mμ in 1 min under the conditions described. In 50 normal individuals, the normal range was between 10 and 40 units, which agreed in range of magnitude with the values reported by us previously using paper chromatographic assay.

Serum glutamic oxaloacetic transaminase was measured in 50 normal individuals, 22 patients with cardiovascular disease uncomplicated by acute infarction, 14 patients with various infections, 17 patients with neoplastic diseases, and 16 patients with acute transmural myocardial infarction. Venous blood was obtained for serum transaminase determination without regard for the fasting state; the serum was separated from the clotted blood within from 2 to 12 hr after collection. It has been found that the activity is essentially unchanged if the separated serum is stored in a refrigerator from 1 to 10 days after collection. When possible, daily tests were made during a 5- to 15-day period.

The normal values of serum glutamic oxaloacetic transaminase activity ranged from 10 to 40 units. Figure 1 summarizes the serum transaminase activity on various days after infarction in 16 patients with acute transmural myocardial infarction. Figure 2 presents the average values in the same patients and indicates the range of activity on the first 4 days following the infarction. Figure 3 shows the serum transaminase activity along with the sedimentation rate during a 9-day period in a 60-yr-old patient who incurred an acute transmural posterior wall myocardial infarct. It is noted that 3 hr following the onset of pain, the transaminase activity was within normal limits but rose to 500 units within 12 hr, falling off gradually to normal by the sixth day. This series has now been extended to 30 patients, all of whom exhibited transaminase levels of from 100 to 6000 units on at least one of the five days following the onset of myocardial infarction.

In 22 patients with heart disease uncomplicated by acute myocardial infarction including arteriosclerotic heart disease associated with angina or coronary insufficiency and acute and chronic congestive heart failure of varying etiology, the serum transaminase activity ranged between 12 to 45 units. In two instances the level was above upper limits of normal (40 units); one patient had acute pulmonary edema and expired within 24 hr, and in another with neurogenic shock the serum transaminase was 45 units but fell to 19 within 24 hr.

All patients with acute febrile and chronic infectious diseases had serum transaminase activities within the normal range. There was little observable change in the enzyme level from the acute to the convalescent state of the illness and little variation in daily samples tested. Normal values were also encountered in uremia, pulmonary infarction, neoplastic disease per se, and other chronic processes. High levels were encountered in jaundiced patients with active liver disease.

It has been estimated that 1.5 percent of the dry weight of pig heart muscle is the protein enzyme, glutamic oxaloacetic transaminase (*4*). We have calculated that if 1 g of dried pig heart homogenate of the value reported by Cammarata (*5*) was diluted to 6 lit, there would be 400 units of activity per milliliter.

Our observations show that the serum transaminase activity rises with regularity within 12 to 24 hr in acute human myocardial infarction and returns to the normal range within 3 to 6 days thereafter. The mechanisms by which the level of the enzyme activity is altered are under study. The limited number of cases presented does not permit final evalution of these ob-

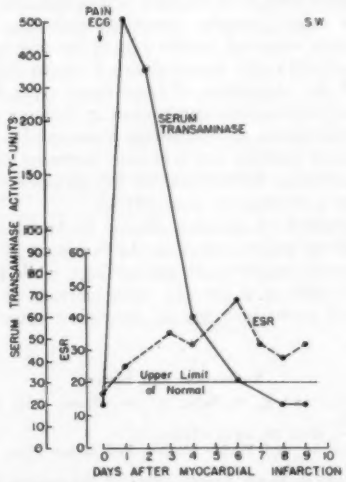

Fig. 3. Transaminase levels obtained during a 10-day period following acute myocardial infarction in patient S. W. The dotted line represents the erythrocyte sedimentation rates done on the same blood samples.

servations in regard to their diagnostic and/or prognostic significance.

Conclusions. (i) Glutamic oxaloacetic transaminase activity has been measured in human serums by a spectrophotometric method. (ii) The variations in enzyme activity in some disease states have been discussed. (iii) The serum transaminase activity in 16 patients with acute transmural myocardial infarction rose to levels 2 to 20 times normal within 24 hr and returned to normal range within 3 to 6 days thereafter without exception.

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17 May 1954.

Biuret Toxicity of Urea Foliage Sprays on Citrus

Winston W. Jones

Department of Horticulture, Citrus Experiment Station, University of California, Riverside

Urea was first used as a foliage spray to supply nitrogen on apples in 1943 (*1*). Since that time it has been used as a foliage spray on other crops (*2–4*). When attempts were made to use such sprays on citrus, leaf injury resulted (*5*). This injury was a yellowing of, or loss of chlorophyll from, the distal part of the leaves and has been called "yellow-tip." It was found that the amount of yellow-tip varied with the location and with the age of the leaf. The yellow-tip is a permanent injury; the leaves do not regreen. However, subsequent new leaves do not have yellow-tip unless additional urea sprays are applied. The extent of the yellowing may vary from none to more than half of the leaf.

Since crystalline urea "sets-up" and becomes hard, most of the urea for foliage spray application now on the market has been conditioned in various ways to avoid the hardening. To determine whether yellow-tip is caused by urea or by some impurity in the urea, several spray experiments have been made (*6*). Since yellow-tip had also been observed on trees in the field to which soil applications of conditioned urea had been applied, soil experiments were also made.

One experiment was performed in a grove of mature navel orange trees in August 1953. In this experiment, sprays of 10 lb of crystalline urea per 100 gal of spray were compared with sprays of the same concentration of conditioned urea. Approximately 6 wk after spray applications, yellow-tip was prevalent on the trees sprayed with the conditioned urea but not on the trees sprayed with crystalline urea. This suggested that yellow-tip was the result of something in the conditioned urea and was not caused by urea alone.

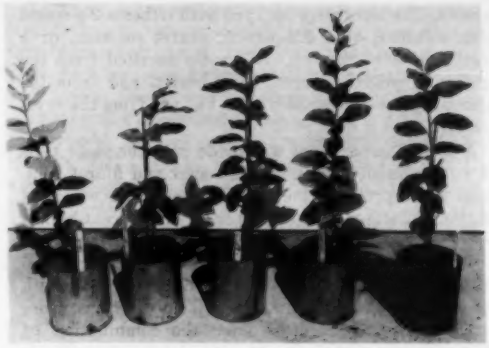

Fig. 1. Foliage sprays of combinations of biuret and urea on young budded lemon trees. Left to right: Check no spray, 0.2-percent biuret, 2-percent crystal urea, 0.2-percent biuret plus 2-percent crystal urea, and pelletized urea. Note yellow-tip (mottling) except on check and 2-percent crystalline urea plants.

Most of the conditioned urea on the market is in the form of pellets. In the making of such pellets, the urea is warmed. It has long been known that on warming, urea is converted to biuret (*7*). Biuret toxicity following foliar application of urea has been reported on pineapples (*8*). Thus biuret was the first suspect as the cause of yellow-tip. Several sources of pelletized urea were examined for biuret by the use of alkaline copper sulfate and were found to contain from 0.5 to 2.5 percent of the dry weight of a biuret-reacting material.

Following the field results, several greenhouse experiments were made to compare pelletized urea, crystalline urea, biuret, and combinations of crystalline urea and biuret. For these experiments, young budded lemon and Valencia orange trees (*9*) were used. Figure 1 shows the results of one spray experiment on

Fig. 2. Soil applications of biuret and urea to young budded lemon trees. Left to right: Check no treatment, 50 ml of 0.2-percent biuret, 50 ml of 2-percent crystal urea, 50 ml of 0.2-percent biuret plus 2-percent crystal urea. Note yellow-tip (mottling) except in check and crystalline urea treatment.

lemons. The trees were sprayed with either a 2-percent urea solution, or a 0.2-percent biuret solution, or a combination of the two. Yellow-tip resulted from the sprays of pelletized urea, from biuret, and from the biuret-crystal urea combination but not from the crystal urea.

A second experiment was made with the same type of young budded trees, but the urea and biuret solutions were applied to the soil. The treatments consisted of 50 ml of either 2-percent urea, or 0.2-percent biuret, or a combination of the two applied to each 1-gal can (Fig. 2). Yellow-tip resulted from all treatments containing biuret but not from crystalline urea. In both the spray applications and the soil applications, more severe yellow-tip resulted from the combination of urea with biuret than from biuret alone, although yellow-tip occurred in both instances.

The results reported indicate that biuret is a material in commercial ureas that induces leaf yellow-tip of citrus from either foliage or soil applications.

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19 May 1954.

Investigation of the Reported Toxicity to Rats of *Gliricidia sepium*, Jacq.

Laurence E. Gale, Melvin R. Gibson, Paul M. Scott

School of Pharmacy,
State College of Washington, Pullman

It has been reported (*1–3*) that the plant *Gliricidia sepium*, Jacq. is toxic to rodents. In fact, the Latin name *Gliricidia* means "rodent poison" (*4*). However, no pharmacologic investigation of this plant has ever been made to substantiate or disprove these claims. This is the purpose of this investigation.

The dried plant material, with the exception of the roots used in this study was collected by Barbara Norby in Quizzaro de San Jose, Costa Rica (*5*). Identification of the plant was by Mrs. Norby and Alexander F. Skutch. It was air-dried in Costa Rica before shipment.

The fresh leaves used in this investigation were from 40 plants grown for 2 yr in our pharmacy greenhouse. The seeds were obtained from the plant collections of Mrs. Norby. The roots used were the oven-dried roots of the 2-yr-old, greenhouse-grown plants.

The plant material was prepared for toxicity tests as follows: (i) The dried, mature leaves, young leaves, seeds, fruits, and roots were ground to a No. 60 powder. (ii) To concentrate the constituents of the leaves, 90 g of the dried, young leaves was successively and totally extracted in a Soxhlet extractor with petroleum ether, ether, and chloroform. The marc from the chloroform extraction was dried and then boiled with 1500 ml of absolute alcohol. An additional 300 ml was added after ½ hr of boiling. The marc from this extraction was treated as the previous one, using 70 percent alcohol instead of absolute alcohol. The remaining marc was subsequently extracted in a Soxhlet using distilled water. The solvents containing the extractive from these extractions were evaporated, and the residues were used in the toxicity studies. (iii) Entire, fresh, compound leaves were mixed in a Waring Blendor with 230 ml of distilled water to a puree consistency. To remove fibrous material, the mixture was strained through a single thickness of cheesecloth.

For comparison of dosage, moisture determinations were made of fresh leaves and the young dried leaves. The fresh leaves had an average moisture content of 79.5 percent; the young dried leaves, 4.5 percent.

The study of the toxicity of *Gliricidia sepium*, Jacq. was divided into four parts. One hundred thirty-five mature albino rats were used in the study, and control groups were maintained for each portion of the work. First, the toxicity of the air-dried, mature leaves, young leaves, seeds, fruits, and roots was determined. The dose of each of the powdered plant parts given to individual groups of rats was 1 g/kg administered for 6 consecutive days. Second, a study was made of the toxicity of the six extracts prepared by phytochemical methods from the young leaves. Expressed approximately, in terms of the dried young leaves, the doses of the extracts administered orally to the rats for 6 consecutive days were petroleum ether, 6 g/kg; ether, 8 g/kg; chloroform, 15 g/kg; absolute alcohol, 15 g/kg; 70-percent alcohol, 10 g/kg; cold distilled water, 10 g/kg. Third, the toxicity of an aqueous mixture of fresh green leaves was evaluated. The doses administered orally to groups of rats for 6 consecutive days were 0.75 g/kg; 1.5 g/kg; 2.0 g/kg; 3.0 g/kg. Fourth, a 45-day extended-toxicity study was performed using the dried, powdered, young *Gliricidia* leaves. The doses of the young leaves that were administered for 45 days were 0.25 g/kg; 0.50 g/kg; 1.00 g/kg. At the end of the 45-day test period, blood samples were taken for hematologic examination, and the animals were sacrificed. The intestinal tract of each animal was examined, and stained tissue mounts were prepared for histologic examination of the heart, liver, kidneys and spleen.

The fresh leaves, dried parts, and extracts of *Gliricidia sepium*, Jacq. used in this investigation appeared to be completely devoid of toxicity to rats. No deaths were observed in any of the groups of animals that could be attributed to the *Gliricidia* administered. The

animals' hair retained its normal luster; there were no signs of loss of reflexes, anorexia, chemosis, increase or decrease in salivation, gastrointestinal disturbances, or change in the consistency of the feces. The results of the hematologic and histologic examinations performed following the termination of the 45-day extended-toxicity study also indicated that there were no pathologic developments that could be used to differentiate the test animals from the control animals.

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25 May 1954.

A Device for Determining Time and Temperature of Sterilization in the Autoclave or Hot-Air Oven

John H. Brewer and C. Baxter McLaughlin

Biological Research Laboratory, Hynson, Westcott & Dunning, Baltimore, Maryland

Since one often is concerned with whether or not sterilization has been properly carried out, a number of indicators have been marketed. Except for continuous-reading electric thermocouples, many of these indicators show only that the temperature has been reached.

Chemical melting points have always been acceptable as reliable indicators of temperature if they remain pure. By enclosing the proper compound in a sealed glass tube so constructed that it permits the flow of the molten material, one may determine the temperature as well as the length of time that the temperature remained constant. This apparatus is small and inexpensive and may be used countless times. It has a definite advantage in that it can be used in any place in the autoclave or oven and included in packages and containers of materials for sterilization.

An hourglass type of apparatus was constructed in such a manner that the solid chemical would melt and flow through a narrow constriction into the bottom tube (Fig. 1). Our idea was that, when molten, the material would flow through a standard-size opening at a uniform speed. Unfortunately, when the liquid formed in the upper part of the sealed hourglass-shaped tube, an air pocket formed and prevented the flow. When a side-arm by-pass tube was connected to the upper and lower sections, the air could pass freely and the molten material could flow. Thus by controlling the constriction in the tube and having the pressure equalized, we had a unit that was physically suited for our purpose.

There are many compounds that will melt at 121°C. Unfortunately, the problem is not quite as simple as merely selecting one of these compounds for our purpose, because some of them will not repeatedly melt and flow at the desired temperature.

In view of these considerations, we have used several compounds, two of which are succinic anhydride, $OCOCH_2CH_2CO$, mol. wt. 100.07, melting at 120°C; and *dl*-mandelic acid —$C_6H_5CHOHCOOH$, mol. wt. 152.14, melting at 120°C.

Mandelic acid is very applicable but unfortunately will melt and flow only once at 120°C. On repeated meltings, the melting temperature is considerably lower. This might be advantageous for a single use in certain operations. On the other hand, succinic anhydride remains constant in its ability to melt and flow repeatedly and is, therefore, our choice for use in this temperature range. Its physical characteristics are listed adequately (*1*).

To evaluate and observe these tubes we constructed an insulated oil bath with thermostatic controls and circulated with motor-driven propellers. Using this equipment, we were able to maintain a temperature of 120.5° to 121.5°C with ease and could determine the flow of various compounds at the desired temperature.

Tubes were constructed by professional glass manufacturers (*2*) with uniform dimensions, and the chemical compound of choice could be accurately weighed into the tube. They were heated in an oven to melt and the tube was sealed. Repeated tests showed that 1 g of

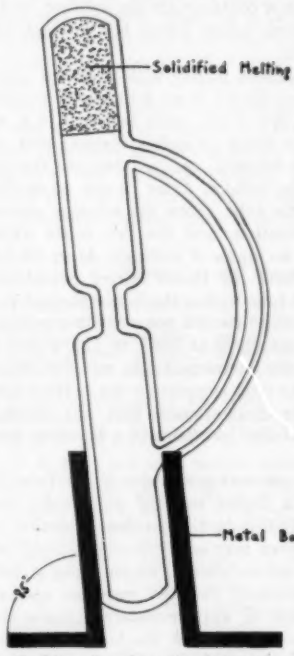

Fig. 1. Line drawing showing cross section of Time-at-Temperature device with metal base.

succinic anhydride would melt and flow at 120° to 121°C in 15 to 17 min. Therefore we feel that we have an apparatus that will truly indicate that the predetermined temperature was reached and held for a minimum sterilizing time. It should be mentioned that at 118° to 119°C, 2.5 hr were required for the succinic anhydride to melt and flow. At 125°C, 1 g would flow in 8 min. It seems from our experiments that these time differences are more or less comparable to sterilizing time.

Although the newer autoclaves are well equipped with automatic time and temperature controls, the arrangement of the load will determine the actual time and temperature required for sterilization and cannot be adequately preadjusted to take care of the widely varying conditions of use in the laboratory. Many of these autoclaves are well equipped with thermocouples and recording instruments to place in varying spots in the autoclave, but for the most part only a few leads are available and one cannot do a heavy spotting of these recording thermocouples because of the expense involved. However, many of these smaller melting-point tubes can be included in every square foot of the sterilizer without adding substantially to the load or occupying valuable space. The Time-at-Temperature (T@T) Tubes can be mounted in special holders and placed on shelves or suspended in the chamber. They could also be affixed to rods of glass or stainless steel and mounted in various positions in large containers of solution. Since the T@T Tube is hermetically sealed, it cannot contaminate the solution and it need not be removed before filling the product into the final container.

To simulate conditions in line with practical usage, 6 lit of solution was placed in an 8-lit Pyrex solution bottle and three T@T Tubes were fastened to a rod in the center of the bottle in such a manner that one tube was above the solution, one just beneath the surface, and one on the bottom. After 15 min at sterilizing temperature, the tube above the solution showed only partial sterilization, and the two tubes within the liquid showed no signs of melting. After 20 min the T@T Tube above the liquid melted completely, and the uppermost tube within the liquid showed partial melting; the lower tube did not melt. It was necessary to keep the autoclave at 120° to 121°C for 30 min to melt the upper submerged tube and for 55 min at 120° to 121°C to melt completely the bottom tube. This showed quite dramatically that the solution heated, not uniformally, but more in a layering manner.

Obviously, by constructing a larger T@T Tube device and placing a higher melting point solid that melts at 166° to 167°C in these tubes, a device for use in the hot-air oven may easily be constructed. We have found that *p*-phenylphenol, which melts at 166° to 167°C, is satisfactory for this purpose, and the tubes with a volume of approximately 3 times that used in the autoclave will check the hot-air sterilization for 1 hr at this temperature.

Because these T@T Tubes are so inexpensive they can be employed in large numbers and also may be used by the small laboratory that cannot afford expensive recording thermocouples.

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14 May 1954.

Apparent Simultaneous Adaptive Enzyme Formation in C_{57} Mice

P. Feigelson,* M. Feigelson, T. R. Wood

Department of Biochemistry, Fels Research Institute, Antioch College, Yellow Springs, Ohio

Adaptive enzyme formation in microorganisms—that is, increases in enzyme concentration induced by the presence of the substrate—has been known for many years (*1, 2*). The existence of a similar mechanism in higher animal forms has been hypothesized (*3*), but only recently has supporting evidence been adduced. Recent studies have indicated that mammalian tissue levels of tryptophan peroxidase and xanthine oxidase (*4, 5*) increase subsequent to administration of the appropriate substrate. Gordon and Roder also reported a similar adaptive increase in the adenosine deaminase activity of chick embryos (*6*).

In vivo experiments indicated that considerable fractions of injected xanthine are metabolized along synthetic pathways (*7*). This suggested that an enzyme concerned with xanthine anabolism, as well as the enzyme xanthine oxidase, might be amenable to adaptive increase. In this study, therefore (*8*), both liver xanthine oxidase and adenosine deaminase levels were determined following prolonged administration of xanthine to C_{57} mice. The findings indicate that both liver xanthine oxidase and adenosine deaminase levels increase following xanthine administration, suggesting that a type of simultaneous adaptive enzyme formation may occur in mammals, as has been demonstrated by Stanier to occur in microorganisms (*9*).

Thirty C_{57}BL/6 male mice were divided into three experimental groups of 10 animals each. Group I, the control animals, received daily intraperitoneal injections of physiological saline; groups II and III were injected with suspensions of xanthine in saline, the daily dosage being 12 and 24 mg, respectively, of xanthine per 100 g body weight. The animals were fed Purina dog chow *ad libitum*. This regime was maintained for 14 to 20 days, at which time the mice were sacrificed. Homogenates prepared from two pooled livers were analyzed for xanthine oxidase by the procedure of Axelrod and Elvehjem (*10*) and adenosine deaminase using a modification of the procedure of Gordon and Roder (*6*).

The results of the *in vitro* analysis of liver enzyme activities are depicted in Table 1 as the mean values and range of values for each experimental group. It is to be noted that there are increases in the liver

Table 1. The effect of xanthine administration on the concentrations of liver xanthine oxidase and adenosine deaminase.

Group No.	I	II	III
Xanthine administered (mg/day, per 100 g body weight)	0	12	24
Xanthine oxidase			
μlO_2/hr, per g wet weight	342(321–361)	422(382–438)	493(415–614)
μlO_2/hr, per g dry weight	1360(1180–1570)	1850(1480–2010)	2110(1780–2940)
μlO_2/hr, per μM nitrogen	0.163(0.148–0.181)	0.208(0.177–0.230)	0.236(0.187–0.313)
Adenosine deaminase			
μM adenosine deaminated/hr, per g wet weight	46.9(28.1–69.8)	61.6(51.2–69.7)	86.6(64.0–141.1)
μM adenosine deaminated/hr, per g dry weight	185(117–245)	272(201–323)	381(263–672)
μM adenosine deaminated/hr, per μM nitrogen	0.0226(0.0136–0.0345)	0.0308(0.0241–0.0403)	0.0416(0.0288–0.0716)

xanthine oxidase and adenosine deaminase activities as the result of prior xanthine administration to the animals. Furthermore, the extent of the adaptive increases are a function of the administered dose of xanthine. Livers of group III animals possess 44 percent higher xanthine oxidase and 85 percent higher adenosine deaminase activities than those of control animals. The increases in xanthine oxidase over the control values exhibited by both groups of xanthine-treated mice are significant at the $p = 0.01$ level, using Wilcoxon's nonparametric test (*11*). Owing to the greater variation in enzyme concentration among animals within the experimental groups, the increases in adenosine deaminase activities of groups II and III over the control animals are significant at only the $p = 0.10$ and $p = 0.05$ levels, respectively. Expression of the enzyme activities on the basis of liver dry weight or nitrogen does not essentially alter these relationships.

It was observed that irrespective of experimental groups, animals with high liver xanthine oxidase activities also manifested high liver adenosine deaminase activities. The coefficient of correlation between the concentrations of these two liver enzyme systems was calculated to be 0.89 which is significant at the $p < 0.001$ level. When the xanthine oxidase activity is plotted versus the adenosine deaminase activity for each animal, the relationship shown in Fig. 1 is obtained.

These observations strongly imply that a similar mechanism controls the concentrations of both liver enzymes. Possible mechanisms by which this may occur are (i) a sequential adaptation; that is, the increases in anabolic products subsequent to xanthine administration provide increased substrate levels for adenosine deaminase resulting in an adaptive increase in that enzyme; (ii) xanthine itself evokes adaptive increases in adenosine deaminase by possibly combining with the enzyme protein; (iii) xanthine administration indirectly induces increases in both adenosine deaminase and xanthine oxidase, for example, via adrenal stimulation. Experiments are currently under way to explore further these factors.

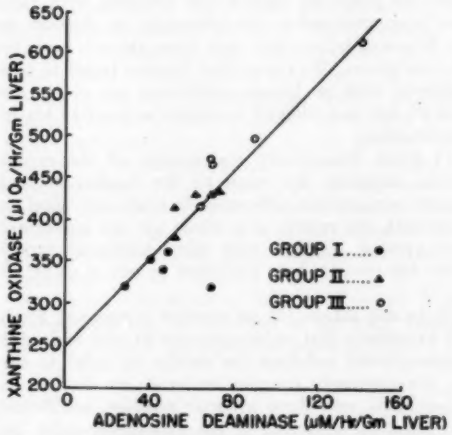

Fig. 1. Relationship between liver xanthine oxidase and adenosine deaminase activities.

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* Present address: Institute of Cancer Research, Columbia University College of Physicians and Surgeons, Francis Delafield Hospital, New York 32.

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17 May 1954.

Communications

Tests for Photoreactivation in Gametes of *Urechis caupo*

Ultraviolet-induced injury to the sperm of the sea urchin, *Arbacia punctulata*, is not reversed by subsequent illumination with visible light, although eggs are readily photoreactivated (*1*). Since the point is one of considerable theoretical interest, it seemed desirable to compare photoreactivation in the gametes of another animal. Studies were therefore made on the sperm and eggs of the echiuroid worm *Urechis caupo* for a comparison of photoreactivation in these gametes.

The worms were collected in Elkhorn Slough on Monterey Bay, California, and kept in running sea water. After withdrawal from the gonosac of the worm, the sperm were diluted 1:400 in 0.05*M* glycine (*2*) in sea water, but the eggs were kept in sea water. By running sea water around the syracuse dishes containing the eggs or sperm, all samples were kept at 16° ± 2°C. Only combinations of gametes giving 90 to 95 percent fertilization and good development were used for experiments. The appropriate gametes were exposed to the radiations of a Sterilamp (mainly wavelength 2537A), the dosage being determined by a Hanovia UV meter. Photoreactivation was accomplished with a G.E. CH-4 Mercury Spotlamp 2 ft from the samples and filtered through 2 to 5 in. of water and a Corning No. 3060 filter to remove heat and ultraviolet radiations, respectively. A 1-hr exposure to the white light alone was not injurious to either sperm or eggs, although it is injurious to the sperm of some animals (*3, 4*). The samples were stirred by playing a jet of air on the surface of the water. The time required for 50 percent of the zygotes to reach the two-celled stage was used to measure the effect of the different treatments, and each of the experiments was repeated at least three times.

Eggs irradiated with a dosage of 3000 erg/mm² of UV and fertilized with normal sperm were delayed in cleavage, a span of time 32 percent longer than the controls being required for half of the eggs to reach the first division. When ultraviolet-injured eggs were treated with white light for 15 min, the delay was reduced by 64 percent, indicating an average of 64 percent photoreactivation. The results were comparable, whether the eggs were illuminated before or after fertilization with untreated sperm.

Dosages of UV from 40 to 480 erg/mm² had no effect on sperm, since eggs inseminated with them were fertilized and cleaved at times comparable to those of controls. Only 50 percent of the eggs were fertilized with sperm given a 3200 erg/mm² dosage of UV, and cleavage was delayed. Sperm subjected to UV dosages of 6400 to 12,800 erg/mm² were generally incapable of fertilizing eggs, only a small percentage of the eggs being activated. These ultraviolet-induced injuries were in no case reversed by illumination with white light; in fact, the injuries were exacerbated. The sperm of *Urechis*, therefore, resemble those of *Arbacia* (*1*) in being incapable of photoreactivation by white light after ultraviolet-induced injury.

Since the possibility exists that a maximal amount of photoreactivation is achieved by the visible light present as an impurity in the spectrum of the Sterilamp, the UV used for irradiating sperm was passed through a visible-light-absorbing filter (*5*) ($CuSO_4$ and $NiSO_4$), which transmits about 70 percent of the UV at 2537A. The results were essentially the same as in the afore-described experiments. Ultraviolet-induced injury to the *Urechis* sperm nucleus therefore appears to be irreversible and is not susceptible to photoreactivation under the conditions tested.

R. M. Iverson
A. C. Giese
Hopkins Marine Station, Pacific Grove, California

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21 June 1954.

Remarks on Fischer's Article, "Stress and the Toxicity of Schizophrenic Serum"

We wish to put on record some facts concerning the investigation of Roland Fischer (*1, 2*) and to state our disagreements with his conclusions. Fischer acknowledges that his work with *Xenopus laevis* tadpoles was *started* under the direction of one of us (F. G.); but since his published figures are identical with those that he summarized in our laboratory in 1949–50, we are driven to believe that they form the sole basis for his conclusions. We regret that Fischer failed to communicate with us before publishing his paper and that we are thus obliged to object in print to his interpretations:

1) After reexamining statistically all the experimental material, we came to the conclusion that, despite considerable differences in some individual experiments, the results as a whole are *not significant*. This opinion together with other biological experiments has recently been published by one of us (H. P. R., *3*).

2) In this article (*3*) no mention is made of Fischer's hypothesis that sudden changes in cold and warm weather would influence the results. In order to survey the extremely complex material, we divided the experiments into three groups: positive, indifferent, and negative, according to the hypothesis under discussion, that schizophrenic body fluids are more toxic than normal ones. Admittedly, a comparison of the

results of the experiments that Fischer reports as having been done under "homogeneous" and "inhomogeneous" weather conditions, on the basis of their biologically positive, indifferent, and negative outcomes, yields a somewhat lower average value of toxicity (with schizophrenics *and* normal controls) for the group of experiments in "inhomogeneous weather." However, the relationship of positive to indifferent to negative findings of 6 : 5 : 2 (or, in percentages, 46 : 39 : 15) is just as good as the one in "homogeneous weather," namely, 22 : 22 : 12 (percentages, 39 : 39 : 21). Thus, while not excluding the possibility of an influence of the weather, it must be stated that the reported experiments do not demonstrate it.

3) We agree with Fischer's statement that serum inactivated by heating is slightly less toxic, but this applies equally to schizophrenic, other pathologic and normal control serums. Experiments with dialyzed serum were ambiguous; some dialyzed serums, but by no means all, were somewhat less toxic than the undialyzed serums, which in most cases unfortunately were very little toxic to begin with.

In these schizophrenic serums, a toxicity in the dialyzate could not be seen, whereas just two dialyzates of normal serums showed considerable toxicity. While these results may be accidental, they certainly do not provide evidence of a dialyzable principle specific for schizophrenia.

4) Fischer seems unaware of the fact that the results of his short series of double-experiments are variable: he overlooks differences up to 8 toxicity units from sample to sample under identical conditions with an average standard error for a single experiment of $\sigma \pm 2.5$ toxicity units at least, and this in "homogeneous weather"! Detailed statements concerning a correlation between toxicity and psychic status of the patient, or conclusions from one or two experiments only, as drawn by Fischer in the cases of hyperemesis, cirrhosis, carcinoma, or pregnancy, are therefore unwarranted.

5) Calculating a "0.001 level of confidence" from an arbitrarily selected group of experiments is not justified, considering that some patients with extremely high toxicity indices figure several times in Fischer's data (see, for example, Rieder, patients 1 and 2, Table 1), whereas others on account of unproved influences are omitted. As was pointed out by Rieder (*3*), differences between normal controls and schizophrenics as a psychiatric group must be evaluated on the basis of the number of *patients* investigated and not on the basis of the number of experiments repeated on these patients with unequal frequency.

Our main contention is that the *Xenopus* method is unsuitable for the detection of the toxic factor in the body fluids of schizophrenic patients (*3*).

F. Georgi
H. P. Rieder
R. Weber

Research Laboratory, Psychiatric University Hospital, "Friedmatt," Basel, Switzerland

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23 March 1954.

In the foregoing remarks, Georgi *et al.* examine the data of my earlier experiments under a *new* aspect; that is, they disregard the question of whether the results were obtained under controllable, reproducible conditions; then they introduce further statistical analysis. The note of Georgi *et al.* is based mainly on their disregard of the influence of a weather front factor without disproving its existence. I refer, therefore, to another paper of mine that brings further evidence to show how major frontal changes are operative in our biological experiments (*1*).

It is unfortunate that my former associates were unable to grasp the main conclusion of my paper under discussion (*2*) that "the toxicity to tadpoles of serum" of different diagnostic groups "seems to be positively correlated with the degree of stress." In contradistinction to what seems to be the opinion of Georgi *et al.*, I have made no claim whatsoever of a toxic factor specific for schizophrenia (*2*).

The serum and urine toxicity studies under discussion were initiated, designed, and performed under my supervision. I would have expected that Georgi *et al.*, having recently "reevaluated" part of the data I left behind 4 years ago, would have communicated with me before publishing their "main contention that the *Xenopus* method is unsuitable for the detection of the toxic factor in the *body fluids* of schizophrenic patients." I am sorry that I must challenge their unsubstantiated generalization.

That tadpoles at large are suitable test animals to detect the toxicity of schizophrenic serum was already shown by Lazell and Prince (*3*). With the tadpoles of *Rana catesbiana* they demonstrated a toxicity of schizophrenic blood serum tenfold to that of normals. Also, Malis (*4*) was able to show a significant difference in the toxicity of the blood of acute schizophrenics if compared with the blood of normal healthy controls; his test animals were tadpoles of *Rana temporara*.

With the aid of *Xenopus* tadpoles, I could detect one of the main toxic factors in the *urine* of schizophrenics: ammonia (*1*).

If Georgi *et al.* had considered that the more acidic urine of schizophrenics (*1*) contains more ammonia [owing partly to the higher protein catabolism, decreased appetite, and so forth (*5*) of these patients], Weber, under the direction of Georgi, would not have published the papers (*6, 7*) showing that preparations of some 50-liter portions of schizophrenic urine contained more of a mobile ion as measured by ionophoresis. However, "the high toxicity" as measured by their paramecia-test "clearly excludes ammonia, monomethylamine and dimethylamine as the cause," *sic* Weber (*7*). Apparently the paramecia-test method of Georgi *et al.* is unsuitable and caused them to overlook

such a "banal" (*sic* Weber) toxic factor as, for example, ammonia.

Hence it is important to distinguish clearly between specific and nonspecific changes that occur during physiologic or pathologic processes (*5*). For example, it can be shown that the "toxin" present in the urine of menstruating women (*8*) is due mainly to increased amounts of ammonia (*9*), a concomitant of menstrual acidosis. Furthermore, acidosis, a banal change, can produce a decrease in cerebral blood flow (*10*).

Summarized: tadpoles, and especially those of *Xenopus levis*, are reliable test animals, for example, for the detection of a toxic factor in the body fluids of schizophrenics. It is self-evident that the foregoing holds only if one is able to control the conditions under which the experiments are reproducible (*1*).

Finally, I wish to thank Georgi *et al.* for having initiated by their remarks a further clarification of some of our divergent views.

ROLAND FISCHER

Psychiatric Research Unit, Department of Public Health, Regina General Hospital, Munroe Wing, Regina, Saskatchewan

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6 August 1954.

More on "Different IQ's for the Same Individual"

In their independent and valid criticisms of Dreger's study (*1*), Stanley (*2*) and Kurtz (*3*) failed to mention four other highly pertinent considerations.

Perhaps some readers will not recall Dreger's paper. Ten children were each tested on four different intelligence tests, with alternate forms somtimes used. Because numerical IQ's on the same individual "do differ from one another," since there was only one statistically significant correlation between the tests, and because of a significant difference in IQ's as determined by an indefensible method (see criticism by Stanley and by Kurtz), Dreger concluded that "individual's IQ's may differ widely and significantly from one another on different tests." My four additional points of criticism are as follows:

1) It has long been known that numerical IQ's for the same person on different tests may differ because of over-all differences in means and standard deviations and because the tests tap somewhat different functions.

2) The six correlations reported by Dreger are actually based on N's of 9, 5, 7, 6, 7, and 4. Such small N's do indeed aid one in accepting the null hypothesis.

3) Pearson (*4*) as long ago as 1903 demonstrated that correlations are reduced by homogeneity or restriction in range, yet 50 years later we find Dreger drawing conclusions from correlations based on scores that are restricted mainly to average and up (only 5 percent are below average, and not much below at that).

4) Why did Dreger ignore the literature? A quarter of a century ago Goodenough (*5*) reported an r of .74 ($N = 334$) between the 1916 Stanford-Binet and her Draw-a-Man-Test. Wallin (*6*) reported an r of .72 ($N = 290$ clinic cases) between the 1916 Stanford-Binet and Arthur I, and an r of .53 ($N = 172$ clinic cases) between the 1937 Stanford-Binet and Arthur I (contrast this with the r of $-.41$ given by Dreger on five cases!) Cohen and Collier (*7*) found an η of .71 ($N = 51$) for the 1937 Stanford-Binet versus Arthur II, and for the same tests Hamilton (*8*) found an r of .73 ($N = 40$), and Manolakes and Sheldon (*9*) found an r of .64 ($N = 217$ atypical cases: good and poor readers).

We are forced to agree with Kurtz' conclusions that "Dreger's little study has, thus, contributed nothing. . . ." We also agree with Dreger when he concludes that IQ's from different tests are not comparable, but the lack of comparability is not nearly so sad as he would have us believe. We venture the opinion that Dreger, in his reply (*10*) to Stanley and to Kurtz, missed the point of their criticism. We hope that his hope to repeat the experiment is not realized if by repeat he means an exact replication.

QUINN MCNEMAR

Department of Psychology, Stanford University

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7 June 1954.

McNemar's criticism (like Kurtz') of one portion of my statistical treatment is correct. I called it "the most indefensible statistically," although I tried to give justification both logically and statistically. In respect to McNemar's specific points:

1) Yes. I cited only two references of the vast literature on test comparisons. Certainly, these other studies emphasizing tests serve as background for work like mine on intra-individual comparisons.

2) If Binet Forms M and L are considered comparable, N's are then 10, 6, 8, 6, 8, and 4. I used Kendall's (*1*) rank correlation coefficient τ, not Pearson's r. The experiment obviously was not intended as a mass demonstration among tests but, instead, to see how *indi-*

viduals fared. In making significance tests, I adhered to the probabilities given in Kendall's tables. Small N's do, however, make for easier acceptance of the null hypothesis.

3) The host of correlational studies on mental defectives, superior children and adults, and other groups more or less homogeneous must bear the same criticism. IQ's in my study running from somewhat below average to very superior seem to me to cover a rather wide range. Nevertheless, McNemar is right; restrictions of range may limit correlation.

4) It was a search of the literature that prompted me to make my study and submit it for publication. Among 235 items in one of several bibliographies I have available on the subject, only seven are truly relevant items (*2–8*). In the more extended report from which my *Science* article was abstracted, I stated that the significant correlation between the Binet and Goodenough was to be expected (*9–11*). Wallin (*12*) and Hamilton (*13*) had group comparisons similar to many in the literature. Cohen and Collier (*14*) I overlooked for some reason; I am sorry, for their work is closest to mine in several ways. Manolakes and Sheldon (*5*) likewise used two of the tests I employed, but their restriction of possible IQ's (which they carefully pointed out) tended in the opposite direction from mine, that is, toward maximizing correlation. In my search of the literature, however, I found many studies but few that evidenced interest in the individual *qua* individual.

The differences among an individual's IQ's may be wide; if the correlational results of my study are accepted, such differences may be significant. I did not intend to make a contribution to the problem of the "constancy of the IQ," although I sincerely thought that I was making a contribution in terms of different IQ's for the same person. The lack of comparability of IQ's is sad for any one person. With nearly all of my counselees, however, I employ at least two intelligence tests, primarily as a measure of some of their capacities against the background of the standardizing group in each case.

RALPH MASON DREGER

Florida State University, Tallahassee

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16 August 1954.

Serial Cultivation of Normal Human Embryonic Cells Directly on Glass*

Normal human cells from the tissues and organs of a 3½-mo old fetus, obtained at sterilization by total hysterectomy of a psychopathic patient, have been successfully adapted to a glass surface without clot. Three of the cell strains have yielded a tenfold increase in cell count every 5 to 6 days and have undergone 10 transfers.

Clot cultures of skin, muscle, spinal cord, thymus, lung, kidney, spleen, and placenta were prepared in Carrel flasks. The fresh tissue was cut into 1-mm cubes and imbedded in 0.5 ml of chick plasma and 1.0 ml of the culture medium, composed of 40 percent human cord serum, 8 percent chick embryonic extract (diluted 1:1 with Tyrode's solution), 5 percent saline containing 50 units of penicillin and 50 μg of streptomycin per milliliter, and 47 percent Tyrode's solution. An additional milliliter of the culture medium was introduced after clotting had occurred. Proliferation of all cell strains permitted subculturing at 3-wk intervals, and the outgrowth was reimbedded in plasma clots.

Adaptation to a glass surface was accomplished at 9 wk. Two cultures of each of the cell strains were removed from the Carrel flasks, and the dense outgrowth of new cells was dissected from the central tissue mass and from the surrounding clot. These cell fringes (three from each flask) were placed in a 15-ml centrifuge tube with 5 ml of a 0.25 percent trypsin-Tyrode's solution. The tissue was broken up by pipetting and incubating at 37°C for 5 hr. This treatment allowed complete digestion of the clot and liberation of the cells as a suspension. The trypsin-Tyrode's solution was removed after low-speed centrifugation for 5 min. The cells were washed twice with Tyrode's solution, centrifuged again, suspended in 2 ml of the culture medium, and transferred to duplicate Carrel flasks for each cell strain. No cell count was made at this first transfer. The remaining two cultures of each strain were subcultured and imbedded in plasma clots as controls.

The cells adhered to the glass within 24 hr. The original inoculum was heavy, which necessitated the first transfer at 3 days. The trypsin-Tyrode's solution was used to remove the cells from the glass surface of the flask. Digestion of necrotic material and liberation of the cells as a suspension were accomplished after ½ hr of incubation, and the cells were again washed and transferred as described in the preceding paragraph. At this stage, and subsequently, growth was estimated by counting the cells in a hemocytometer chamber. Growth was very rapid in three of the cell strains, and transfers were made every 4 to 5 days with an approximate tenfold increase in cell count each period. The plasma-clot cultures of the same strains doubled in radial outgrowth in 2 to 3 wk. The five remaining cell strains showed a great variation in the rate of growth on the glass surface. Transfers have

* This investigation was supported by grants from the United States Public Health Service, National Institutes of Health, and the cancer research funds of the University of California.

been made to larger flasks and have shown a cell increase similar to that in Carrel flasks.

This method of adaptation of cell growth to a glass surface has been successfully repeated on additional clot cultures of the same embryonic tissue as well as on normal human adult tissue, previously cultured for 2½ yr in clots. Studies are in progress on cell differentiation, histology, nutrition, and chemical analysis of the cells.

ELSA M. ZITCER
RELDA CAILLEAU
PAUL L. KIRK

Department of Biochemistry, University of California, Berkeley

19 July 1954.

Electron Microscope Observations of the Formation of Aluminum Phosphate Crystals with Kaolinite as the Source of Aluminum

In connection with phosphate fixation by soil minerals, it has been shown that phosphate treatment diminishes the kaolinite x-ray diffraction pattern (*1*) and that various aluminum phosphates are the end-products of phosphate-induced kaolinite decomposition (*2*).

By means of the electron microscope, we have observed the progressive formation of aluminum phosphate crystals concurrent with the decomposition of crystals of kaolinite suspended in various phosphate solutions (*3*). In the potassium phosphate system, x-ray diffraction analysis revealed the presence of a compound identical to one shown by analysis (*4*) to be $KOH(Al)_2(PO_4)_2 \cdot 1.7H_2O$, which is similar to minyulite. In the sodium system, x-ray diffraction analysis revealed the presence of a compound identical to product 12 of Haseman *et al.* (*2*) shown by analysis to be $H_{1.7}Na_{1.2}Al_{2.0}Fe_{0.004}(PO_4)_3 \cdot 2.7H_2O$, which is similar to taranakite.

The kaolinite employed was the material passing a 2-mm sieve from our standard W1176 obtained from the McNamee Mine, near Langley, S. C. A 0.1-g sample was treated with about 15 ml of 1.0*M* KH_2PO_4 (*p*H 4.3) and another with 1.0*M* NaH_2PO_4 (*p*H 4.3). In order to hasten the reactions, the samples were placed on a steam hot plate at a temperature of about 90°C.

At time intervals indicated in Figs. 1 and 2 (and oftener), each sample was washed five times with distilled water by the centrifuge method, and then a portion of the sample was removed for electron microscope examination. The remainder of the sample was treated with a fresh phosphate solution of the same composition as before. When electron microscope observations indicated that all of the original kaolinite had been transformed into the new crystalline (phosphate) phase, the samples were again washed five times with distilled water and once with acetone, dried, and x-rayed by the powder method.

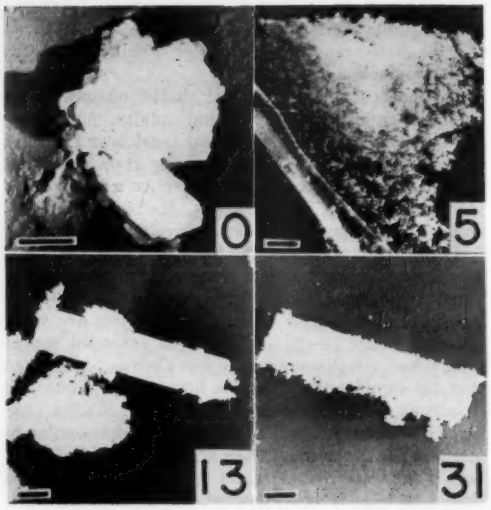

Fig. 1. Electron micrographs of kaolinite treated at 90°C with 1.0*M* KH_2PO_4 at *p*H 4.3 for 0, 5, 13, and 31 days at the end of which minyulite-like crystals had formed as determined by x-ray diffraction (*7*). Line indicates 1μ.

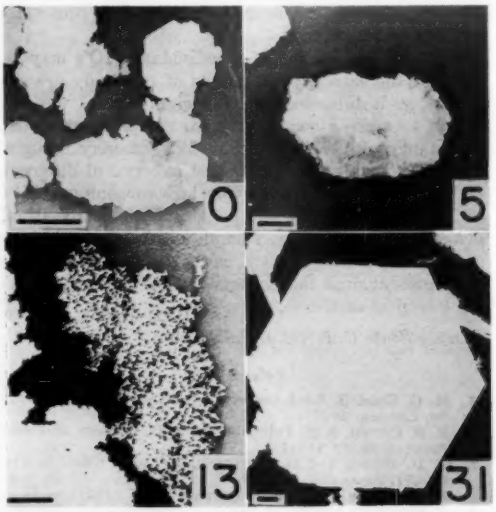

Fig. 2. Electron micrographs of kaolinite treated at 90°C with 1.0*M* NaH_2PO_4 at *p*H 4.3 for 0, 5, 13, and 31 days at the end of which taranakite-like crystals had formed as determined by x-ray diffraction (*7*). Line indicates 1μ.

By use of the electron microscope, we were able to observe the gradual dissolution of the original kaolinite crystals (left at first as a fleecy residue) concurrent with the progressive formation of the new phosphate phase (Figs. 1 and 2). One might think that the large hexagonal crystal in Fig. 2, 31 days, is

kaolinite; however, x-ray diffraction analysis of both systems showed that the new phosphate phase was the only one present, the kaolinite having been completely dissolved. It can be seen then that the formation of aluminum phosphates at the expense of kaolinite is a solution-precipitation phenomenon involving dissociation of aluminum from the kaolinite surface and destruction of the kaolinite crystal, which is in accord with the aluminum-dissociation and solubility-product principles advanced (*5*, *6*) to explain phosphate fixation by soil minerals. Further studies are being conducted with kaolinite and other minerals to find the effects of the phosphate solution concentration, *p*H, and temperature.

J. A. KITTRICK
M. L. JACKSON

Department of Soils,
University of Wisconsin, Madison

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12 July 1954.

Association Affairs

Programs of the Berkeley Meeting, 26–31 December 1954

Advance indications last spring that this year's 121st meeting of the Association at the University of California at Berkeley would be the largest diversified scientific meeting ever held on the Pacific Coast are being realized. In addition to the programs of the Association and its 18 sections, 59 societies and other scientific organizations have scheduled more than 300 sessions; another 30 societies will cosponsor appropriate symposiums. It will also be one of the largest meetings in the long history of the AAAS, now in its 107th year.

The size of the attendance, however, is only one aspect of a successful meeting. It assures that one will find friends and coworkers in one's specialty also attending the meeting, but the physical arrangements, the quality of the programs, the opportunities to meet scientific leaders from other parts of the world, the impact of new concepts, and the general stimulation of informal discussions are all factors of importance. In these respects, too, the Berkeley meeting should be particularly satisfactory.

The campus of the University of California, which is remarkably compact for so large an institution, has an adequate number of well-equipped session rooms. With the exception of the National Geographic Society's annual lecture and accompanying film, to be held in the Berkeley High School auditorium, and the sessions of Section P at the Hotel Claremont, all sessions for papers, symposiums, and evening addresses will be held on the campus. Center of the meeting is the large Gymnasium for Men, which will house the one AAAS Registration-Information Center, the Visible Directory of Registrants, the AAAS Science Theatre, and the AAAS Annual Exposition of Science and Industry—with 114 booths. Directly across the street, the University of California Alumni Association has generously made available its new luxuriously furnished Lounge for all who attend the meeting. A variety of university laboratories and museums will be of interest to scientists in all principal fields.

An unusual variety of housing accommodations are available, ranging from the university dormitories—two persons to a room at the nominal charge of $2 each the first night, $1 per night thereafter—and International House, to hotels and motels. Although single rooms near the campus are now scarce, there are ample accommodations in Berkeley, at moderate rates, if colleagues will share a twin-bedded room. Four university cafeterias grouped in one central location will be particularly convenient for luncheons and dinners. The California Academy of Sciences in Golden Gate Park, San Francisco, has issued an invitation to all visitors to tour the Science Museum with its science library and research departments, the Steinhart Aquarium, and its new Morrison Planetarium (admission free to all registrants).

The 121st meeting will have a decidedly international aspect resulting from the concurrence of the Third Berkeley Symposium on Mathematical Statistics and Probability, a 4-day International Conference on Animal Venoms, and the program of the International Union for the Study of Social Insects. The American Physical Society has arranged for the presence of Fritz Zernike, 1953 Nobel prize winner from the Netherlands. Besides the scientists from Europe and the Eastern Hemisphere, a heavy representation from Hawaii, the Philippines, and other Pacific areas is anticipated. In addition to the annual Academy Conference, made up of delegates of the 42 academies of science affiliated with the Association, there will be the recurrent Conference on Scientific Editorial Problems and the Conference on Scientific Manpower. The following data on participating organizations and programs indicate the scope and quality of the meeting.

AAAS as a Whole

General symposium, *Science and Society*: I. "Natural resources: power, metals, food," arranged by Louis B. Slichter; II. "Population problems," by Curt Stern; III, "Impact of science on society," by Roger R. Revelle, 27–29 Dec.

AAAS presidential address by E. U. Condon, and reception, 28 Dec.

AAAS Council meetings, 27, 30 Dec.

Biologists' smoker (for all registrants), 30 Dec.

(Note: For brevity, except for certain joint programs, official cosponsorships have been omitted in the following tabulation.)

A—Mathematics

Section A and the *American Mathematical Society*—Five sessions for contributed papers and invited addresses, arranged by R. E. Langer and D. H. Lehmer, 30, 31 Dec.

American Statistical Association and *Pacific Coast Committee on Statistics of the Social Science Research Council*—Arranged by Maurice I. Gershenson: "Contributions of statistics to physics," and "Regional indexes of business activity," 27 Dec.; "Regional unemployment estimates," 28 Dec.

Institute of Mathematical Statistics—Sessions for papers, arranged by Leo Katz and Evelyn Fix, 26 Dec.

Third Berkeley Symposium on Mathematical Statistics and Probability, sponsored by the Statistical Laboratory of the University of California, arranged by Jerzy Neyman, director, and Elizabeth L. Scott—"Mathematical statistics" and "Statistics in biology and genetics," 27 Dec.; "Statistics in medicine and public health," 28, 29 Dec.; "Mathematics" and "Statistics in psychology," 30 Dec.; "Statistics in industrial research" and "Statistics in physics," 31 Dec.

There will be a joint beer party and dinner for all statisticians and mathematicians.

B—Physics

American Physical Society—About 30 sessions of contributed and invited papers, on nuclear physics, arranged by A. C. Helmholz; high-energy machines, by E. J. Lofgren; solid-state and microwave physics, by Charles Kittel; electron physics, by W. P. Dyke; theoretical physics, by Edward Teller; astrophysics, by Otto Struve; and instrumentation, arranged by Joseph Kaplan, 28–30 Dec.; physicists' dinner, cosponsored by *Section B* and *Sigma Pi Sigma*, 30 Dec.

American Meteorological Society—Symposium, "Climatology," 28 Dec.; and six or more sessions for contributed papers, arranged by Kenneth C. Spengler.

C—Chemistry

Section C and the *American Chemical Society, California Section*—Symposium, "Petroleum chemistry," arranged by John W. Givens, 27 Dec.; symposiums, "Viruses" and "Nucleic acids," arranged by Wendell M. Stanley, 28 Dec.; symposium, "Chemistry in the harnessing of biological resources," arranged by J. C. Lewis, 29 Dec.; sessions for contributed papers, 26, 30 Dec.; chemists' dinner and vice presidential address by Wendell M. Latimer, 29 Dec.

Alpha Chi Sigma—Chemists' luncheon, 28 Dec.

Pacific Southwest Association of Chemistry Teachers—Sessions for contributed papers, arranged by Mother Agnes Schmit, 28 Dec.

D—Astronomy

Section D and the *Astronomical Society of the Pacific*—Symposium, "Nebular red shifts," 27 Dec.; symposium, "Spatial distribution of galaxies," 28 Dec., and symposium, "Distribution of stars in the Russell-Hertzsprung diagram," 29 Dec., arranged by Louis G. Henyey, Jerzy Neyman *et al.*; sessions for contributed papers, 27–29 Dec.; society dinner and vice presidential address, "The new science of radio astronomy," by Bart J. Bok, 29 Dec.; trip to Lick Observatory, 30 Dec.

Meteoritical Society—Sessions for contributed papers, arranged by John A. Russell, 28, 29 Dec.

E—Geology and Geography

Section E—Contributed papers in general geography, cosponsored by the *Association of American Geographers, Pacific Division* and the *Association of Pacific Coast Geographers*, 28 Dec.; symposium, "Earth sciences from the air," arranged by Parker D. Trask, and geologists' smoker and vice presidential address by Meredith F. Burrill, 29 Dec.; contributed papers in general geology, cosponsored by the *Geological Society of America*, 30 Dec.

Arctic Institute of North America—Sessions for papers on arctic science, arranged by John L. Mohr and Joseph T. Flakne, jointly with the Western Society of Naturalists, 28–30 Dec.

Division of Mines, State of California—Mineral exhibit of the Division and large relief map of California, in Ferry Building, San Francisco, open daily, 9 A.M. to 4 P.M. Geologic field trip of the Bay Area and central coast ranges, arranged by Olaf P. Jenkins and Gordon B. Oakeshott, 28 Dec.

National Geographic Society—Annual illustrated lecture with AAAS by W. Robert Moore, "Five-star Burma," 27 Dec.

National Speleological Society—Session for papers and business meeting, arranged by Burton Faust, 28 Dec.

F—Zoological Sciences

International Conference on Animal Venoms, arranged by Nandor Porges, jointly sponsored by *Sections F* and *N*—10 or more sessions on all phases of all groups of venomous animals, 27–30 Dec.

Cooper Ornithological Society—Session for contributed papers, arranged by Frank A. Pitelka, 29 Dec.

Herpetologists League—Arranged by Angus M. Woodbury and Joseph Gorman: symposium, herpetologists' dinner, 29 Dec.; and sessions for contributed papers, 29, 30 Dec.

International Union for the Study of Social Insects—Symposium, arranged by T. C. Schneirla, 28 Dec.

Society of Systematic Zoology and *SSZ Pacific Section* Arranged by R. E. Blackwelder and Robert C. Stebbins: council meeting, symposium, "Animal courtship," film and public lecture on African animals, 27 Dec.; session for papers, open house at California Academy of Sciences, council meeting, 28 Dec.; business meeting, panel on museums, symposium, "Desert evolution," 29 Dec.; session for entomological papers, jointly with the *Pacific Coast Entomological Society*, symposium, "Australian mammals," 30 Dec.; zoologists' dinner and vice presidential address by H. W. Stunkard, cosponsored by *Section F*, 30 Dec.

FG—Biological Sciences

American Society of Limnology and Oceanography—Sessions for contributed papers and business meeting, 28–30 Dec.; symposium, "Recent advances in biological oceanography," arranged by Robert W. Hiatt, 30 Dec.

Beta Beta Beta—Special meeting of Western Region, arranged by Lloyd M. Bertholf, 30 Dec.

Biometric Society, WNAR—Sessions for papers, arranged by Douglas G. Chapman and Elizabeth Vaughan, 27 Dec.

Ecological Society of America and *ESA Western Section*—Arranged by Russell K. LeBarron and E. C. Stone: sessions for contributed papers and ecologists' dinner, 27 Dec.; session for papers and symposium, "Dew as an ecological factor," 28 Dec.; field trip to Muir Woods (redwoods) and Stinson Beach State Park, 29 Dec.

National Association of Biology Teachers—Arranged by Brother H. Charles: business meetings, 27, 28 Dec.; films and panels, "Biology for pleasure" and

"Biology for living," 28 Dec.; panel, "Biology for survival," NABT luncheon, and panel, "Biology laboratory problems," 29 Dec.; field trip to Muir Woods and Stinson Beach State Park, 30 Dec.; business meetings, 30, 31 Dec.; conservation education, 31 Dec.

Society of General Physiologists—Sessions for invited papers, arranged by John Buck, 30 Dec.

Western Society of Naturalists—Symposium, "Natural resources of the West," arranged by Arthur C. Giese, and invited papers in natural history, arranged by John L. Mohr, 27 Dec.; invited papers on "Photochemical effects in biological and biochemical systems," arranged by A. D. McLaren, 27, 28 Dec.; contributed papers in parasitology and business meeting, 28 Dec.; symposium, "The cell," arranged by Daniel Mazia and Roger Y. Stanier, invited papers on "Teaching problems in biology," contributed papers in histology-embryology, contributed papers in ecology, naturalists' banquet and presidential address, 29 Dec.; contributed papers in physiology, 30 Dec.

G—Botanical Sciences

Section G and *Botanical Society of America, Pacific Section*—Symposium, "Modern views on tissue differentiation," cosponsored by the *American Society of Naturalists*, arranged by Adriance Foster, and botanists' dinner and vice presidential address by Stanley A. Cain, 30 Dec.; cosponsorship of symposiums of following G societies.

American Phytopathological Society, Pacific Division Arranged by William B. Hewitt: conference on control of soil microorganisms, 27 Dec.; symposium, "Crop sequence and plant disease control," and phytopathologists' banquet, 28 Dec.; demonstrations, sessions for invited papers on soil-borne virus diseases, sessions for contributed papers and symposium, "Mode of survival of plant pathogens in the soil," 29 Dec.

American Society of Plant Physiologists, Western Section—Symposium on mineral nutrition, arranged by Perry R. Stout, 29 Dec.

Mycological Society of America—Symposium, "Physicochemical control of structural differentiation in the fungi," arranged by Ralph Emerson, 28 Dec.; session for contributed papers, 29 Dec.

H—Anthropology

Section H—Arranged by Gabriel Lasker: symposium, "Indians of western North America" and session for contributed papers, 28 Dec.; symposium, "Culture change in the Pacific region," and session for contributed papers, 29 Dec.; symposium, "Impact of industrialism," and session for contributed papers on demography and human evolution, 30 Dec.

I—Psychology

Section I—Sessions for invited papers on learning, arranged by John P. Seward, and on highway safety, arranged by T. W. Forbes, 28 Dec.; sessions for invited papers on brain function, arranged by Donald B. Lindsley, and on human engineering, arranged by Arnold Small, and vice presidential address by Donald B. Lindsley, 29 Dec.

Society for Research in Child Development—Sessions for contributed papers, arranged by Lois Meek Stoltz, 27 Dec.

Western Psychological Association—Arranged by Rheem F. Jarrett: symposiums, "Present status of psychoanalytic theory" and "Sex differences in personality and intellectual development," 27 Dec.; symposium, "Perception," 30 Dec.

K—Social and Economic Sciences

Section K, Western Economic Association et al.—Panels, "Regional economic analysis," arranged by David Revzen, and "Cost-benefit analysis for natural resource development," arranged by M. L. Upchurch, 28 Dec.; panels, "Trends in urbanization," arranged by Calvin F. Schmid, and "Structure of cities," arranged by Leonard Broom, 29 Dec.; panel, "Organization of research for western development," arranged by Ernest A. Engelbert and social sciences dinner and vice presidential address, "International consequences of scientific research," by John B. Condliffe, 30 Dec.

AAAS Committee for Social Physics—Arranged by Stuart C. Dodd: sessions for invited papers on "Diffusion theory," "Human values measurement," and "Isomorphisms," 27, 28 Dec.

National Academy of Economics and Political Science with the collaboration of *Pi Gamma Mu*—Symposium, "National defense against atomic attack," arranged by Donald P. Ray, 27 Dec.

Society for the Advancement of Criminology—Symposium, "Education in criminology," arranged by William Dienstein, business meeting, and dinner, 28 Dec.

(Note: The programs of the *American Statistical Association* and other groups in statistics will be found under A—Mathematics.)

L—History and Philosophy of Science

Section L and Philosophy of Science Association—Three sessions for contributed papers, 28, 29 Dec.; symposium, "Induction," arranged by E. W. Barankin, and vice presidential address of Chauncey D. Leake, "National loyalty and security in relation to scientific idealism," 29 Dec.

M—Engineering

Section M—Symposium, "Air pollution," arranged by Lauren B. Hitchcock, 29 Dec.; symposium, "Prosthetic devices," arranged by Eugene F. Murphy and Howard D. Eberhart, 30 Dec.

N—Medical Sciences

Section N—Four-session symposium, "Physiology of growth—normal and abnormal," arranged by Howard R. Bierman, and including the vice presidential address of Charles Huggins, 27, 28 Dec.

Alpha Epsilon Delta—Arranged by Maurice L. Moore: symposium, "Preparation for medical education in the liberal arts college," luncheon, and round-table discussions on premedical education, 30 Dec.

American Academy of Forensic Sciences—Symposium on forensic sciences, arranged by Ralph F. Turner, 29 Dec.

American Association of Hospital Consultants—Symposium on hospital problems, arranged by Jack Masur, 30 Dec.

American Psychiatric Association—Symposium on recent advances in psychiatry, arranged by Jacques S. Gottlieb, 30 Dec.

Bay Counties Veterinary Medical Association—Arranged by Joseph M. Arburua: sessions for invited papers on animal diseases, luncheon, and social hour, 28 Dec.

Donner Laboratory of Biophysics, University of California—Symposium, "Recent advances in biophysics and medical physics," arranged by Cornelius A. Tobias, 30 Dec.

Pacific Slope Biochemical Conference—Sessions for submitted papers, arranged by David M. Greenberg, 30 Dec.

Society for Experimental Biology and Medicine, Southern California and *Pacific Coast Sections*—Symposium, "Adrenal-pituitary relationships," arranged by Robert H. Dreisbach, and session for contributed papers, 28 Dec.

Society of American Bacteriologists, Southern California and *Northern California-Hawaii Branches*—Sessions for contributed papers, arranged by Frances A. Hallman and H. J. Phaff, 28 Dec.

Section Nd—Dentistry

Section Nd, American College of Dentists, American Dental Association and *North American Division of International Association for Dental Research*—Symposium, "Growth and development," arranged by Wendell L. Wylie, luncheon, symposium, "Radiation hazards in the dental office," arranged by Gordon M. Fitzgerald, 28 Dec.

Section Np—Pharmacy

Section Np, American Association of Colleges of Pharmacy, American College of Apothecaries, American Drug Manufacturers Association, Scientific Section of American Pharmaceutical Association, American Pharmaceutical Manufacturers Association, and *American Society of Hospital Pharmacists*—Arranged by Donald C. Brodie: symposium, "The pharmacy internship" and three sessions for contributed papers, 28, 29 Dec.

O—Agriculture

Section O—Symposiums, cosponsored by the *Western Society of Soil Science,* "Soil management problems in western agriculture," arranged by H. B. Cheney, and "Water supplies and irrigation," arranged by F. J. Veihmeyer, 27 Dec.; symposiums, "Seed production in the western states," arranged by Frank G. Parsons, and "Problems in horticultural crops," arranged by John H. MacGillivray, 28 Dec.

P—Industrial Sciences

Section P—Arranged by Allen T. Bonnell: round-table sessions on "Basic research—contributions of government, industry, and the university," and luncheon, 30 Dec.

Q—Education

Section Q—Sessions for contributed papers, 27–29 Dec.; concurrent sessions, jointly with *American Educational Research Association,* 27 Dec.; symposium on visual performance, arranged by N. Franklin Stump, 28 Dec.; symposium, jointly with the *International Council for Exceptional Children,* on the exceptional child, and vice presidential address by George C. Kyte, 29 Dec.

AAAS Cooperative Committee on the Teaching of Science and Mathematics—Arranged by John R. Mayor: papers, panel, and evening lecture on "Science teachers for tomorrow," 30 Dec.

National Science Teachers Association—Arranged by Robert Stollberg: panels, "Role of science in the education of youth," "Keeping up to date in science," informal luncheon, buffet supper and social mixer, 27 Dec.; work-discussion groups on "Some problems science teachers must solve," 28 Dec.; session on "Recent research in science" and six concurrent demonstration groups on "Here's how I do it," 29 Dec.

X—Science in General

AAAS Pacific Division—Meeting of executive committee, 31 Dec.

Academy Conference—Business meeting, panel discussion of Academy of Sciences problems, and Academy Conference Dinner, 27 Dec.; Junior Scientists' Assembly—a special program for young scientists—at San Francisco State College, 29 Dec.

American Nature Study Society—Arranged by Ruth E. Hopson: sessions, 26, 27 Dec.; annual meeting and showing of kodachromes, 27 Dec.; joint sessions with NABT, 28, 29 Dec.; field trip to Muir Woods and Stinson Beach State Park, 30 Dec.; sessions, 31 Dec.

Conference on Scientific Editorial Problems—Three sessions for invited papers and discussion, one on "Technical manuals for complex instruments," arranged by Marian Fineman, 29 Dec.

Conference on Scientific Manpower, cosponsored by the *Engineering Manpower Commission, National Research Council, National Science Foundation,* and the *Scientific Manpower Commission*—Sessions for invited papers and discussion, arranged by Thomas J. Mills, 28, 29 Dec.

Honor Society of Phi Kappa Phi—Special program, 29 Dec.

National Association of Science Writers—Symposium, arranged by John Pfeiffer, 28 Dec.

Pacific Science Board—Public Lecture by Alexander Spoehr, 30 Dec.

Scientific Research Society of America—Annual convention and luncheon, annual RESA address by Vannevar Bush and award of William Procter prize, 30 Dec.

Society of the Sigma Xi—Annual Sigma Xi address by Edwin M. McMillan, 29 Dec.; annual convention and luncheon, 30 Dec.

United Chapters of Phi Beta Kappa—Annual address, by Conway Zirkle, 27 Dec.

AAAS Travel Arrangements

A page on AAAS Travel Arrangements has appeared at intervals in the advertising sections of both journals of the Association; a gratifying number of coupons has been received and acknowledged. Group flights to Oakland or San Francisco, 26 Dec., and return, 31 Dec.—either by chartered *first-class* DC 6B or 7 planes (at rates approaching those for coach flights) or as extra sections of existing flights are in the final stage of arrangements. (As on all scheduled flights, individual insurance may be carried.) ***All persons east of the Rockies who plan to fly to the meeting and have not sent in a AAAS Travel Coupon are urged to do so immediately.***

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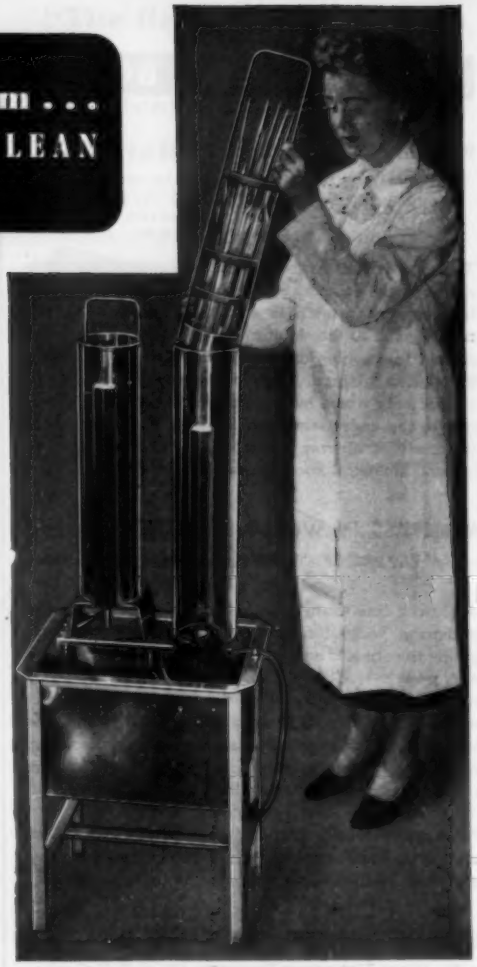

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Meetings & Conferences

October

24–27. Soc. of American Foresters, Milwaukee. (H. Clepper, 425 Mills Bldg., Washington 6, D.C.)

25–27. Assoc. of American Medical Colleges, Bedford Springs, Pa. (AAMC, 5 S. Wabash Ave., Chicago 3.)

25–30. International Cong. of Odontology, 1st, São Paulo, Brazil. (F. Degni, Rua Marconi 131, São Paulo.)

26. Assoc. of Consulting Chemists and Chemical Engineers, annual, New York City. (A. B. Bowers, 50 E. 41 St., New York 17.)

27–28. Conf. on Plastics in Building, Washington, D.C. (Building Research Inst., 2101 Constitution Ave., Washington 25.)

27–29. International Symposium on the Hypophyseal Growth Hormone, Its Nature and Actions, Detroit, Mich. (R. W. Smith, Henry Ford Hospital, Detroit 2.)

28–30. American Soc. for Aesthetics, Bloomington, Ind. (R. R. Patrick, Cleveland Museum of Art, Cleveland 6, Ohio.)

28–30. International Symposium on Temperature, Washington, D.C. (W. Waterfall, 57 E. 55 St., New York 22.)

31–1. American Soc. for the Study of Arteriosclerosis, annual, Chicago. (A. C. Corcoran, Cleveland Clinic, Cleveland 6, Ohio.)

November

1–3. Entomological Societies of Canada and Ontario, annual, Sault Ste. Marie, Canada. (R. H. Wigmore, Science Service Bldg., Ottawa.)

1–3. Geological Soc. of America, annual, Los Angeles, Calif. (H. R. Aldrich, 419 W. 117 St., New York 27.)

1–3. Paleontological Soc., annual, Los Angeles, Calif. (K. E. Caster, Dept. of Geology, Univ. of Cincinnati, Cincinnati 21, O.)

1–5. National Metal Cong., Chicago, Ill. (C. L. Wells, 7301 Euclid Ave., Cleveland, O.)

3–5. American Crystallographic Assoc., and 12th annual Pittsburgh Diffraction Cong., Pittsburgh, Pa. (P. K. Koh, Allegheny Ludlum Research Laboratories, Alabama Ave., Brackenridge, Pa.)

3–5. Soc. of Rheology, Washington, D.C. (W. R. Willets, Titanium Pigment Corp., 99 Hudson St., New York 13.)

3–6. American Soc. of Parasitologists, Memphis, Tenn. (A. C. Walton, Dept. of Biology, Knox College, Galesburg, Ill.)

3–6. American Soc. of Tropical Medicine and Hygiene, Memphis, Tenn. (J. E. Larsh, Jr., School of Public Health, Univ. of North Carolina, Chapel Hill.)

4–5. Hawaiian Acad. of Science, Honolulu, Hawaii. (D. C. Cox, Experiment Station, HSPA, Honolulu 14.)

4–6. American Acad. of Tropical Medicine, Memphis, Tenn. (E. H. Hinman, Univ. of Puerto Rico School of Medicine, San Juan 22.)

6. Committee for the Scientific Study of Religion, fall, Cambridge, Mass. (R. V. McCann, 48 Mt. Auburn St., Cambridge.)

7. American College of Dentists, Miami, Fla. (O. W. Brandhorst, 4221 Lindell Blvd., St. Louis, Mo.)

7–12. International Cong. of Military Medicine and Pharmacy, Luxemburg, Luxembourg. (A. R. Vernengo, Pozos 2045, Buenos Aires, Argentina.)

8–11. American Dental Assoc., annual, Miami, Fla. (H. Hillenbrand, 222 E. Superior St., Chicago 11, Ill.)

(See issue of 17 September for more comprehensive listings.)

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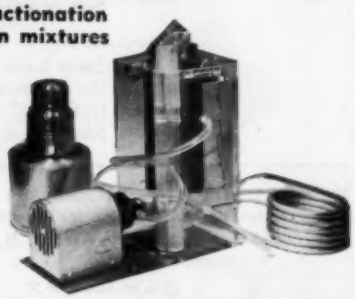

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